Mining CONGRESS JOURNAL

FEBRUARY 1949

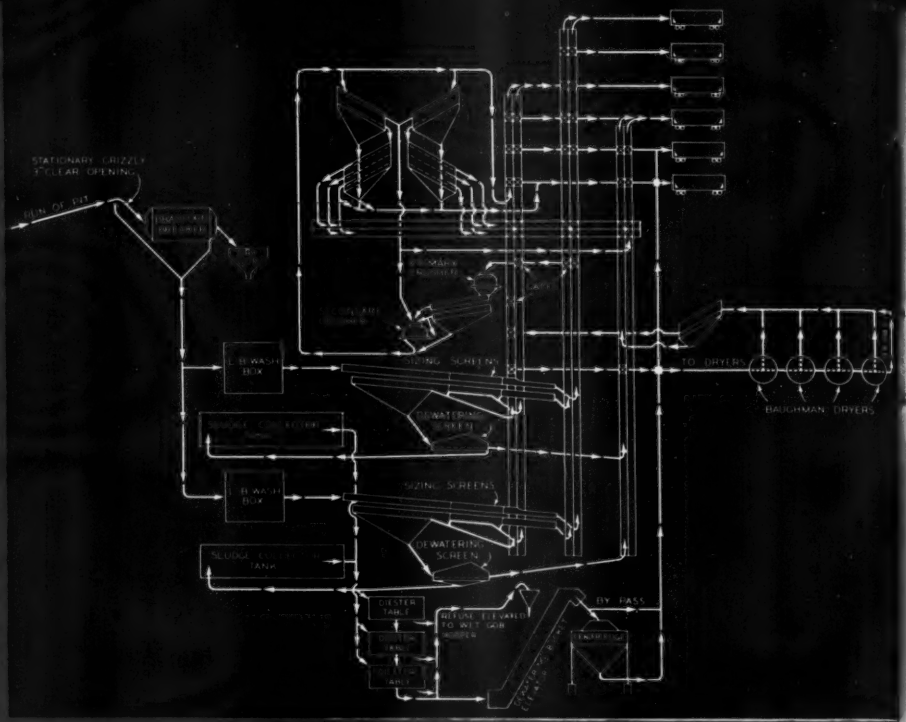
Annual Review and Forecast

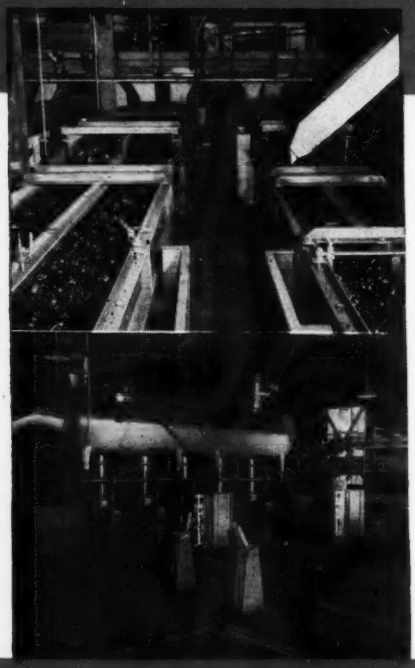
CENTRAL INDIANA COAL COMPANY PLANT

Features

LINK-BELT

two-compartment oscillating conveyors





Again Link-Belt pioneers with new technique and equipment in coal preparation and handling, at the new strip mine of the Central Indiana Coal Company at Odon, Indiana — a Link-Belt designed and equipped plant.

A feature of this plant is the use of Link-Belt oscillating conveyors to tap off 6 x 4, 4 x 2, 2 x 1 ¼, and 1 ¼ x ¾ inch coal to the loading booms. Each oscillating conveyor handles two different sizes of coal by means of a separator compartment (see illustration at left).

A Link-Belt belt conveyor takes coal from the hopper where trucks dump the coal from the strip operation. This hopper is equipped with remote control reciprocating plate feeders which deliver the coal to the belt conveyor equipped with special impact idlers. Two Link-Belt air-pulsated washing units are used (see lower illustration at left).

We'll be glad to give you further details of this and other Link-Belt preparation plants. Get in touch with our nearest office.

LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Mo., Cleveland 13, Indianapolis 6, Detroit 4, St. Louis 1, Seattle 4, Toronto 8.

11,348

COAL PREPARATION AND HANDLING EQUIPMENT

Engineered, Built and Backed by LINK-BELT

DESIGNED FOR LASTING PERFORMANCE and Economical Maintenance

Remember, the "Automat" loads, in its stride, any lump of coal that will pass through your tipple, or any lump of rock your cars, aerial tram or larries can take.

There are two reasons for the well known, lasting performance of the Whaley "Automat." First, the "Automat" is simple in design. All working mechanisms are strong, functional and smooth-working. The "Automat" is so organized that it is easy to get at the elements for that ALL-IMPORTANT MAINTENANCE. Well organized, simple elements make maintenance an easier job, save hours of maintenance time . . . a major economy factor in the operation of the "Automat." Perfect balance between parts reduces strain . . . requiring less power for operation. In addition, only the "Automat" gives you the safe, smooth shovel action . . . big capacity at less than 1/5 KWH per ton of material loaded. Only the "Automat" gives you equal efficiency whether you are loading coal, rock or slate. Myers-Whaley Co., Knoxville 6, Tenn.

MYERS-WHALEY

MECHANICAL LOADERS EXCLUSIVELY SINCE 1908

MORE SAFETY

Gardner - Denver
Model H K K
Safety Hoist

Four important safety features protect the operator and the load when you choose a Gardner-Denver Air Hoist:

1. Two piston rings on each piston provide enough compression to hold a maximum load almost stationary.
2. A powerful, oversize band brake with quick adjustable take-up holds any load in suspension.
3. The Splined Clutch has a self-locking latch which cannot be disengaged unintentionally.
4. The single throttle lever automatically returns to neutral when released.

Other features of Gardner-Denver Air Hoists:

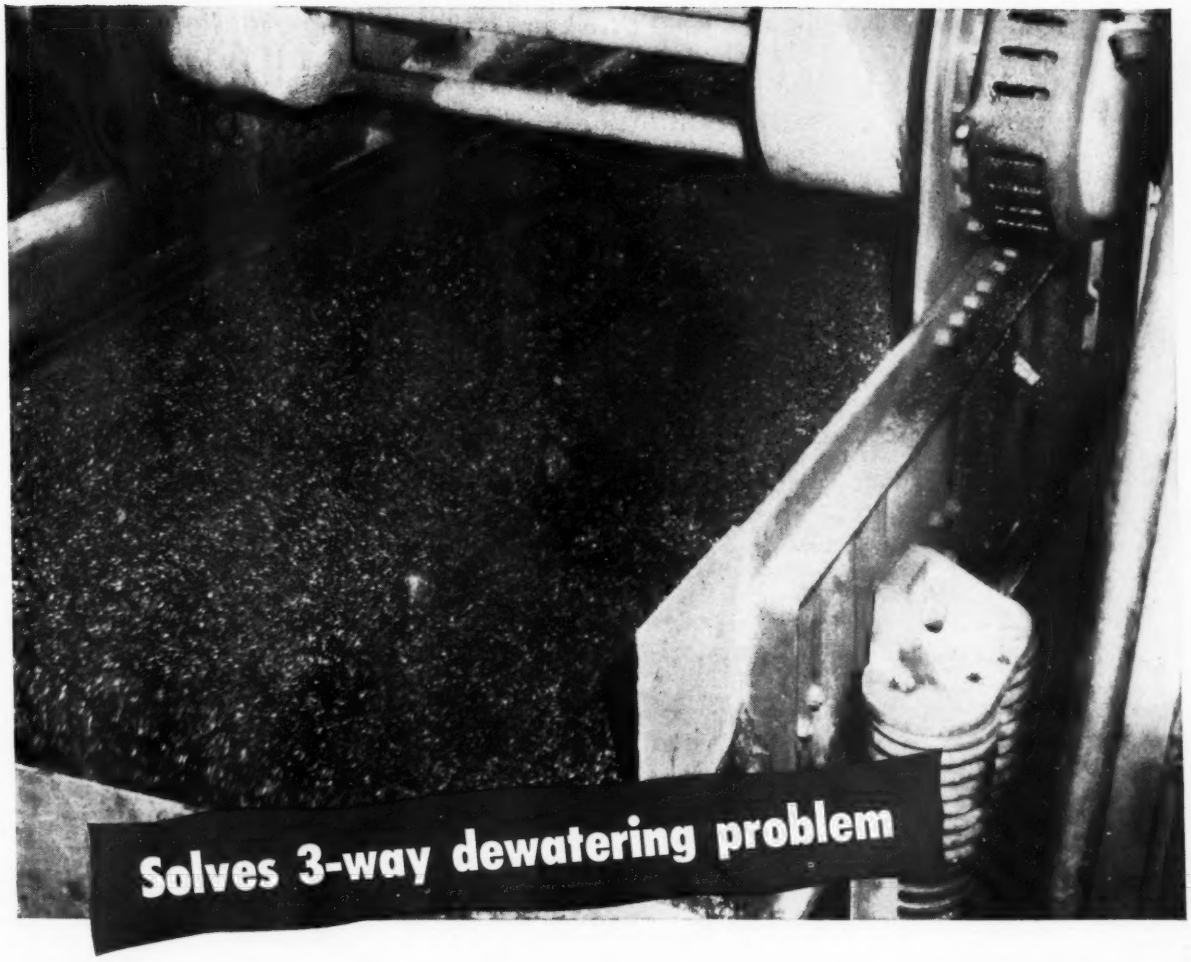
SPEED—*5-cylinder radial air motor handles capacity loads quickly. Overlap of power impulses greater than on an 8-cylinder automobile engine.*

SIMPLICITY—*single throttle lever operates hoist in either direction.*

LONG LIFE—*completely sealed gear train keeps oil sealed in, water and dirt sealed out. Three-point lubrication of all moving parts.*

GARDNER-DENVER SINCE 1859

For complete information, write Gardner-Denver Company, Quincy, Illinois



Leading coal company reduces ash content, increases salable tonnage, reduces road hazards

The Philadelphia & Reading Coal & Iron Co. solved three troublesome problems with two Robins Eliptex Dewaterizers.

First—to remove −¾″ pyrites and other ash-forming substances from No. 5 anthracite. Feeding this coal very wet (400 gals. of water per minute to 40 tons of coal per hour) to one Eliptex Dewaterizer, they simultaneously produce low-ash coal and effectively dewater that coal.

Second—to reclaim fines from washed No. 4 anthracite. Another Robins Eliptex Dewaterizer not only removes a high percentage of the surface moisture but salvages some 125 tons per hour of salable fines.

Third—to eliminate winter highway hazards. The Robins Eliptex Dewaterizers do such a thorough dewatering job that there are no trails of ice-forming drippings from trucks loaded at the Philadelphia & Reading breaker.

Many breaker and tipple operators report the Eliptex Dewaterizer far more effective than devices costing ten times as much. What is more, this low initial cost is matched by low operating cost, low maintenance cost.

You will actually profit by installing the Robins Eliptex Dewaterizer. May we place the facts before you?

ROBINS

ELIPTEX DEWATERIZER

SEND TODAY for your copy of new Robins Bulletin 129. Fully illustrated, it describes the outstanding features, advantages and benefits of the money-saving Robins Dewaterizer. Address the Robins Conveyors Division, 270 Passaic Avenue, Passaic, New Jersey.

ROBINS CONVEYORS DIVISION **HEWITT-ROBINS INCORPORATED**

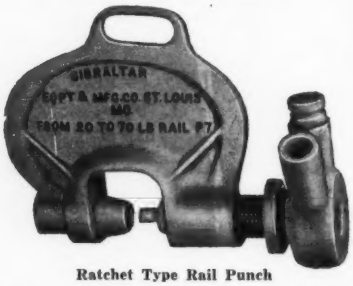
Gemco Tru-blu "Master Miner's" Tools Give You Top Tonnage Always! Made by:—

GIBRALTAR EQUIPMENT & MANUFACTURING CO.

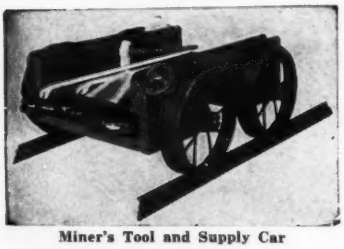
EVERY GEMCO TOOL A GEM OF ENGINEERING DESIGN FOR TOPS IN EFFICIENCY!

Successors to: Tallman Manufacturing Co., and the Track Tool Division of The Oliver Corporation, P. O. Box 304, Alton, Ill., U.S.A.

Ratchet Type Rail Bender



Ratchet Type Rail Punch



Miner's Tool and Supply Car

"Tielock" Type Rerailer

Rail Benders—Standard and ratchet types equipped with labor-saving Timken roller type thrust bearings.

Rail Levelers—Take the "hog" out of dished rail.

Keyseating Machines—Cut slots, grooves, keyways, etc., in wheels, gears, sprockets, pulleys, castings, etc.

Rerailers—Four sizes, light, flexible for emergency.

Grease Guns—"Friction Doctor" hand and roller base types. For all self-leveling oil base pressure greasing.

Mine Trucks and Cars—Track layers, drillers, supplies, shot firers, inspection speeders, ambulances, tool, section crew, cardox, trouble shooting cars, etc.

Complete Parts—For making your own cars, trucks.

Rail Punches—Standard, ratchet and the new multiple leverage (gives 3 to 1 efficiency—⅓ the effort).

Adaptors—Convert all portable punches to shop type, and all old punch units to the new multi-leverage type.

Carstops—Extra heavy to stop hardest shock loads.

Derailers—"Tielock" gives absolute safety features.

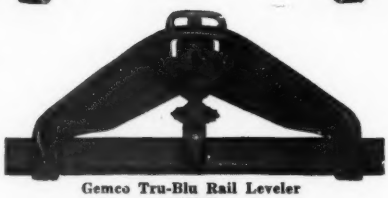
Spike Bars—With tool leverage bar combinations.

Combination Tools—"Slipon" fittings give a tool for every required track purpose right at your finger tips.

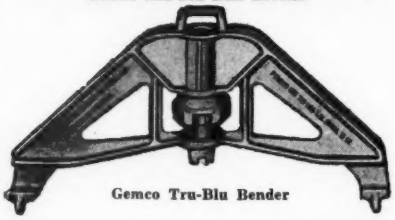
Mining Car Wheels—Iron and steel, cast and pressed.

AVAILABLE FOR IMMEDIATE SHIPMENT BY THE:— MINE TOOL AND EQUIPMENT PEOPLE

The Gibraltar Equipment & Manufacuring Company offers a complete line of essential track tool, supply and equipment items of unsurpassed quality to simplify and speed the laying and maintenance of track; both narrow gauge for mining, logging and lumbering, sand, clay and gravel pits, etc.; and also standard gauge track for all types and classes of railroads. In addition to the great variety of tool and equipment items, which we offer as standard products, we specialize in the design and manufacture of tool and equipment items for special needs. Let "Gemco Tru-Blu" tools give you "TOP SAVINGS WITH COMPLETE MINING SAFETY."



Gemco Tru-Blu Rail Leveler



Gemco Tru-Blu Bender

GET THE MINING TOOLS OF TOMORROW, TODAY; BY USING "GEMCO MASTER MINER'S TOOLS!"

"GEMCO TRU-BLU MASTER MINER" TRACK GAUGES AND LEVELS

AF89–No. 23—Extra strong pipe center with cast steel ends.

AF97–No. 27—Latest approved E.R.E.A. Plan.

AF161–No. 28 Track Gauge

AF80–No. 18.

AF70–No. 10—Made of thoroughly seasoned Western Pine.

AF68–No. 5—Made of thoroughly seasoned Western Pine.

AF164–No. 3—Level 2 Adj. Levels.

AF64–No. 1—Made of Western Pine with hardwood bar.

AF69–No. 6—Steel binding provides 3½" inch elevation.

LET GEMCO TRU-BLU "MASTER MINER'S" TOOLS AND EQUIPMENT GIVE YOU TOP MINE TONNAGE ALWAYS!

JULIAN D. CONOVER
Editorial Director

SHELDON P. WIMPFEN
Editor

Associate Editors
A. W. DICKINSON
G. B. SOUTHWARD
H. L. MOFFETT

Production
B. C. WILKERSON

Mining CONGRESS JOURNAL

Advertising
P. D. MCMURRER, Mgr.

FRANK W. MORAN
(Chicago)

RALPH F. DUYSTERS
(New York City)

RALPH W. HARKER
(Los Angeles and San Francisco)

Contents

VOLUME 35, NUMBER 2 FOR FEBRUARY, 1949

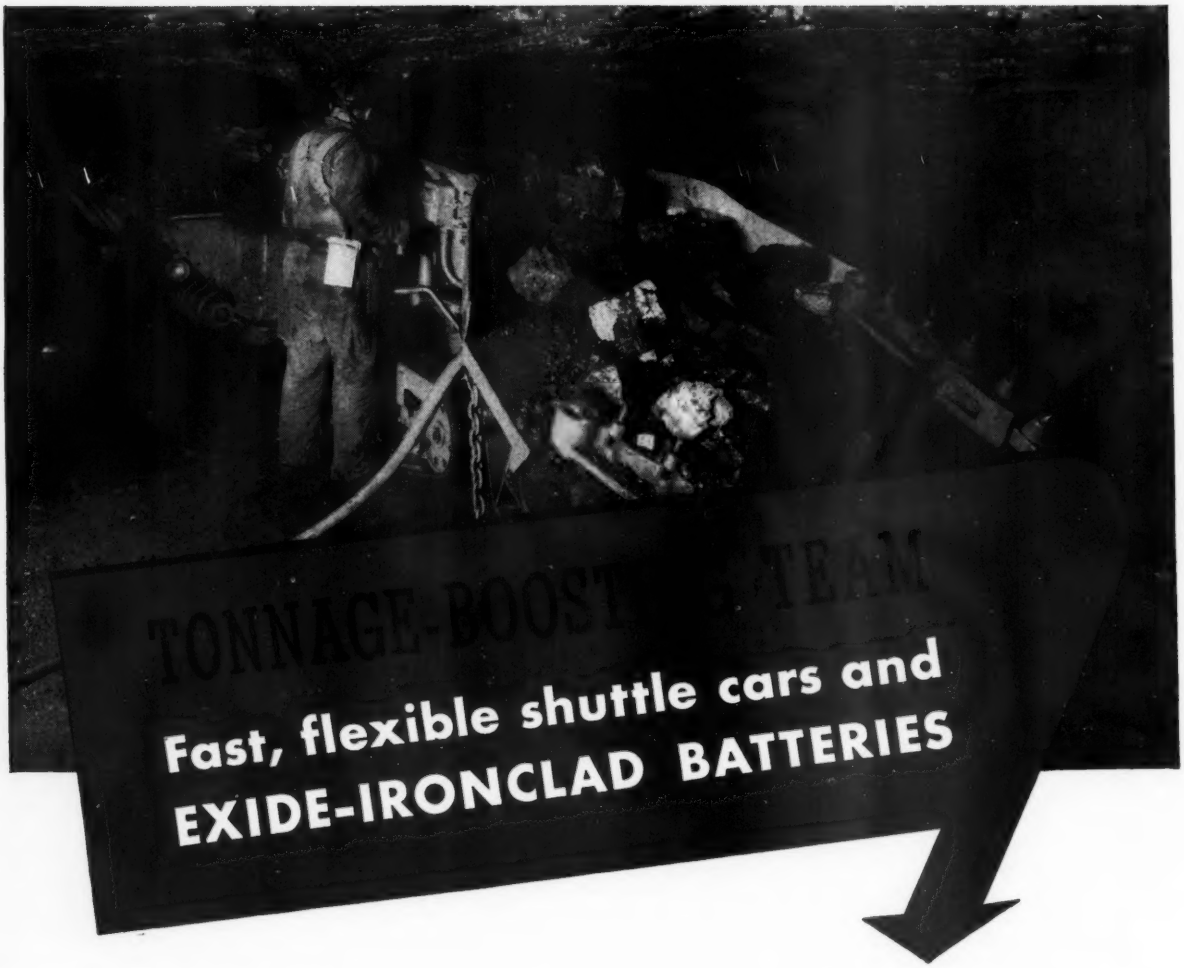
Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

THE AMERICAN MINING CONGRESS
1102 RING BLDG., WASHINGTON 6, D. C.

HOWARD I. YOUNG, *President* — DONALD A. CALLAHAN, *Vice President* — ANDREW FLETCHER, *Vice President* — JAMES D. FRANCIS, *Vice President* — JULIAN D. CONOVER, *Secretary*

Published Monthly. **Yearly subscriptions, United States, Canada, Central and South America, $3.00. Foreign, $5.00. Single copies, $0.30. February Annual Review Issue, $1.00. Entered as Second-class Matter, January 30, 1915, at the Post Office at Washington, D. C.**

Member Audit Bureau of Circulations.



Fast, flexible shuttle cars and EXIDE-IRONCLAD BATTERIES

Production moves swiftly, smoothly, *safely* ...*and you can count on full shift availability* ...when your battery-powered haulage units are equipped with Exide-Ironclad Batteries.

Exide-Ironclad Batteries are different from all others. They have all four of the characteristics that a storage battery must have to assure maximum performance from mine locomotives, trammers and shuttle cars—high power ability, high electrical efficiency, ruggedness and a long life with minimum maintenance. The combination of these four Exide-Ironclad characteristics assures years of day-in, day-out service with dependability and economy.

1888 . . . Dependable Batteries for 61 Years . . . 1949

SAFE DEPENDABLE POWER

"Exide-Ironclad" *Reg. Trade-mark U. S. Pat. Off.*

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • *Exide Batteries of Canada, Limited, Toronto*

Performance-Proven

POWER PLANTS

International Diesels are *performance-proven*. They have given remarkably dependable and economical service as the engines in International Diesel Crawler tractors. There just isn't any rougher work for an engine. Heavy loads, tough working conditions and long hours of operation all combine to give a crawler tractor engine a real going over.

Make no mistake about it. International Diesels are *performance proven*. You can be sure that you get full measure of profit-producing power from any International Diesel you select.

See your International Industrial Power Distributor or Dealer about your power requirements. He handles the full line of International Diesel and gasoline power units listed at the right.

He will be glad to help you select the right International Power Unit for your specific requirements. And you'll get the benefit of profit-producing power.

INTERNATIONAL ENGINES are available as complete power units in the following models:

DIESEL:	UD-24	180 h.p. @	1375 r.p.m.
	UD-18A	125 h.p. @	1600 r.p.m.
	UD-16	100 h.p. @	1800 r.p.m.
	UD-14A	76 h.p. @	1400 r.p.m.
	UD-9	53 h.p. @	1500 r.p.m.
	UD-6	39 h.p. @	1500 r.p.m.
GASOLINE:	U-9	55 h.p. @	1500 r.p.m.
	U-6	41 h.p. @	1500 r.p.m.
	U-4	31½ h.p. @	1800 r.p.m.
	U-2	22 h.p. @	1800 r.p.m.

Write for informative catalogs on International Power Units:

Form **A-54-LL**
INTERNATIONAL ENGINES AND POWER UNITS
Gas, Gasoline or Distillate

Form **A-251-LL**
INTERNATIONAL DIESEL ENGINES AND POWER UNITS

INTERNATIONAL HARVESTER COMPANY
180 N. Michigan Avenue, Chicago 1, Illinois

Listen to James Melton on "Harvest of Stars" every Wednesday evening—CBS

INTERNATIONAL

CRAWLER TRACTORS
WHEEL TRACTORS
DIESEL ENGINES
POWER UNITS

THE JEFFREY MANUFACTURING COMPANY

958 North Fourth Street, Columbus 16, Ohio

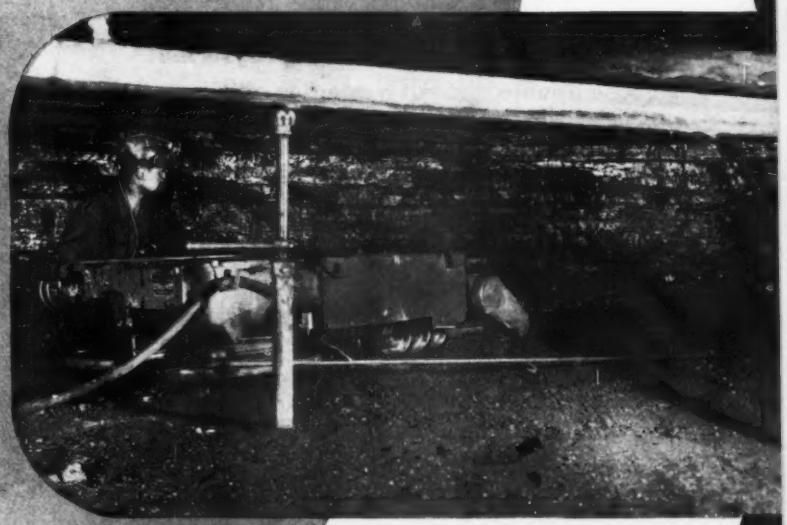
Sales Offices:	Baltimore	Chicago	Denver	Jacksonville	Pittsburgh
	Birmingham	Cleveland	Harlan	Milwaukee	Scranton
	Boston	Cincinnati	Houston	New York	St. Louis
	Buffalo	Detroit	Huntington	Philadelphia	Salt Lake City
Service Stations:	Pittsburgh	Birmingham		Logan-Beckley	Scranton
	Harlan, Ky.	Mt. Vernon, Ill.		W. Va.	
Foreign Plants:	Jeffrey Mfg. Co., Ltd. Montreal, Quebec	British Jeffrey-Diamond Ltd. Wakefield, England		Jeffrey-Galion (Pty), Ltd. Johannesburg, S. A.	

REY
CONVEYOR

anism added to SHORTWALL Machines)

- **Assures a cleaner kerf . . . a better fall of coal**
- **Discharges bug dust in ideal location *along side* of machine**
- **Prevents cuttings being dragged back into cut**
- **Eliminates cleaning kerf by manual labor**
- **Releases a man for other duties—timbering, drilling, etc.**
- **Removes hazard of overhanging coal . . . as in hand shoveling when man must work near the face**

This mechanism, or screw conveyor, may be seen in the outlined view above mounted on a Jeffrey 35-L SHORTWALL cutter. It can be applied to machines in the field. Let us tell you more about it.



Right . . . Jeffrey 35-L SHORTWALL equipped with Slack Conveyor. Note end of screw conveyor near base of cutter for moving slack back from the finished cut.

Patented

When Other Machines are Down for Repairs

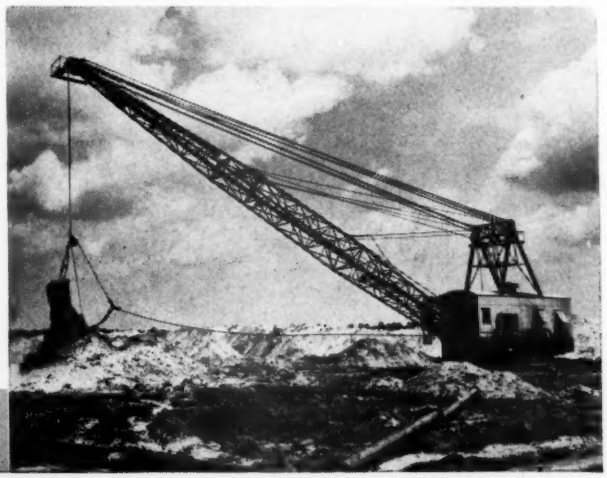
Bucyrus Walkers are Moving Dirt

The secret of the low maintenance requirements of a Bucyrus-Erie walking dragline lies in its complete simplicity. Look one over from stem to stern — you can't help noticing the absence of intricate gears and shafts, the lack of complicated gadgets that cause trouble and put a crimp in efficiency.

Main machinery parts are big in size, small in number, easy to get at. Walking machinery has nothing more complex than a shaft and a rolling cam, whose smooth rotating and sliding action cushions the machine down without jerk or shock.

Booms: 110 to 250 ft.
Buckets: 4 cu. yd. to 25 cu. yd.

Maintenance is low on a Bucyrus-Erie because there's so little that can go wrong. That means more time to make full use of the famous "years ahead" digging action that produces the production results you want!

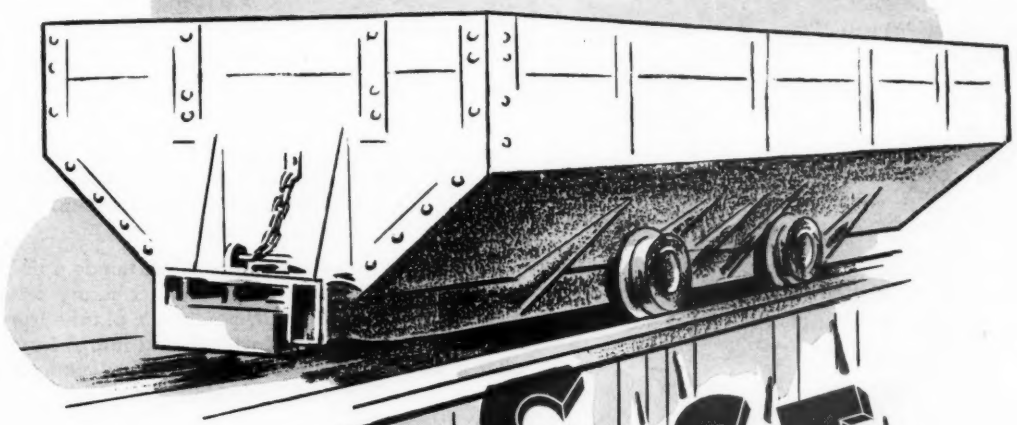


BUCYRUS ERIE

23M47

SOUTH MILWAUKEE, WISCONSIN

DROP-BOTTOM CARS



will drop your COSTS

Cut the *idle time* of your loaders. A.C.F. Drop-Bottom Mine Cars eliminate waits and delays at the tipple. 'Lubricated' doors trip-and-unload, close-and-latch *while the trip is in motion!* One company empties a whole 14-car trip of 5-ton A.C.F. cars in just 70 seconds! Speed like that raises loading machine efficiency...lowers haulage costs...increases mine output.

Find out just how much time and money A.C.F. Drop-Bottom Cars can save. Call in our Sales Representative today.
American Car and Foundry Company, New York · Chicago · Cleveland · Washington · Huntington, W. Va. · St. Louis Berwick, Pa. · Pittsburgh · Philadelphia San Francisco

A.C.F. MINE CARS

for Greater Coal Output

"BEST TRACK WE EVER LAID!"

Another vote for prefabricated track. They finally got tired of a patched-up track system, put together with odds and ends. So they switched to Bethlehem's prefabricated. Now that it's in, they wish they'd done it years ago.

Maybe your own haulage system needs a going-over. If so, Bethlehem prefabricated track offers many advantages. For this is *planned* track—a system that's planned for your individual needs, down to the last bolt and nut. A layout developed after a Bethlehem engineer has studied your workings, your system of mining, your individual problems.

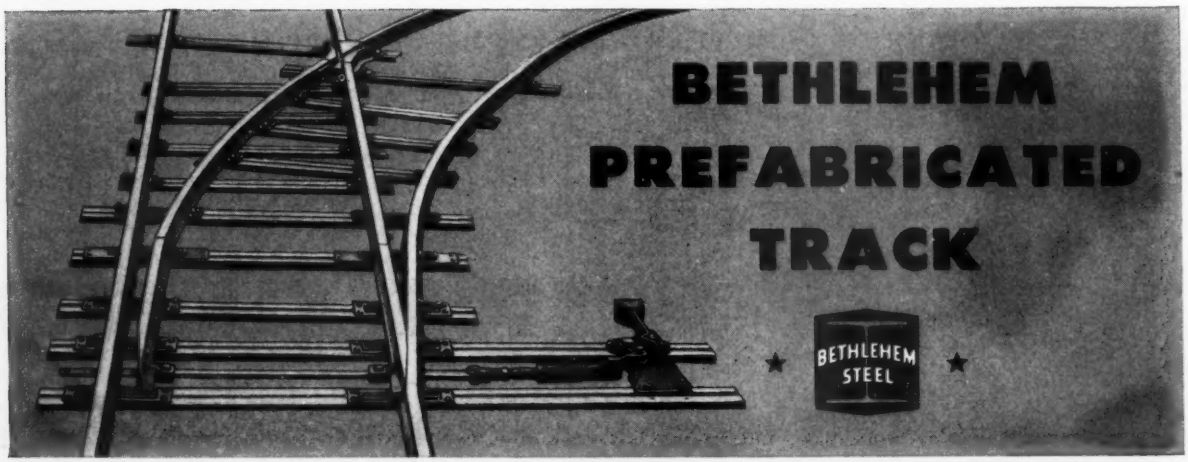
When this has been done, and you yourself have approved the plan submitted, Bethlehem precurves and precuts the rails, prefabricates other parts. The track comes to you ready for assembly, with rails clearly numbered (by bead weld) to make the job easy. No more than two men are needed to handle any one element.

Results? Less rail required . . . quicker installation . . . faster, safer haulage . . . fewer maintenance worries . . . lower cost per ton hauled.

Expensive? No! Ask for full details.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation



DELEGATION OF RESPONSIBILITY

WKE

To operating executives, plant design and construction represent *extra* responsibilities calling for specialized assistance. Success of the undertaking will depend upon the technical knowledge and experience of those to whom these responsibilities are assigned.

Project management by WKE is first and foremost an acceptance of responsibility — responsibility for top performance in

DESIGN
ENGINEERING
CONSTRUCTION

PRINCIPAL OFFICES
Los Angeles • Sacramento • Salt Lake City • Spokane
Pocatello, Idaho • Denver • Phoenix • Chicago
Hibbing, Minnesota • Bartow, Florida • New York

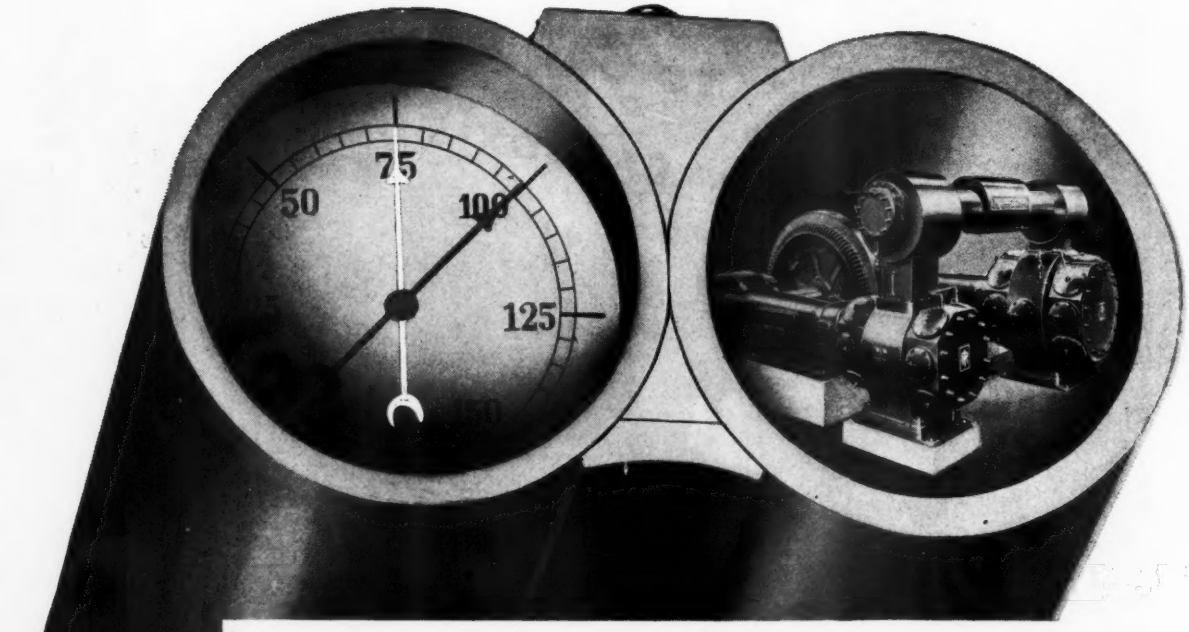
EXPORT DISTRIBUTORS
The Ore and Chemical Corporation
80 Broad Street • New York 4, N. Y.

Continental Europe and North Africa
Dr. Ing. Herbert Lickfett A/B, Stockholm 3, Sweden
Milieu Dense, Paris, France
Ferdinand Egeberg & Company, Oslo, Norway
Midoc, Milan, Italy
A. Schuberth & Company, Basle, Switzerland
G. Maltsiniotis & Co., Athens, Greece
Agence Maritime & Meritime, S. A., Antwerp, Belgium
Adil Gabay & Albert Koenka, Istenbul, Turkey

W.K.E.

WESTERN KNAPP ENGINEERING CO.
DIVISION OF WESTERN MACHINERY COMPANY
760-766 FOLSOM STREET • SAN FRANCISCO 7 • CALIFORNIA

Fire this DOUBLE BARREL *at your mining costs*



1 FULL AIR PRESSURE

Many mines are choking their production and their profits by operating rock drills and other air tools on *insufficient* air pressure at the heading. A seemingly small pressure drop of 10 psi will cut drilling speed as much as 15 to 25%.

Mines have always modernized drilling equipment to get more footage per shift. Why not give these drills a chance to do what they were intended to do? An I-R engineer will help you make a pressure check . . . at the drills. Perhaps just a *change* of piping will do the trick . . . larger, or more direct, or new feeder lines. Or possibly you may need more compressor *capacity* . . . at the main plant or at booster stations.

2 MODERN COMPRESSORS

If you need a new compressor, you will want the best. Ingersoll-Rand's "PRE" synchronous-motor-driven compressor (shown above) is the kind of machine that any mining man would be happy to operate . . . any mine proud to own. These compressors are full of valuable money-saving features that you cannot buy in any other compressor . . . features that save power, save maintenance. You can't afford to over-look the "PRE" in any modernization program.

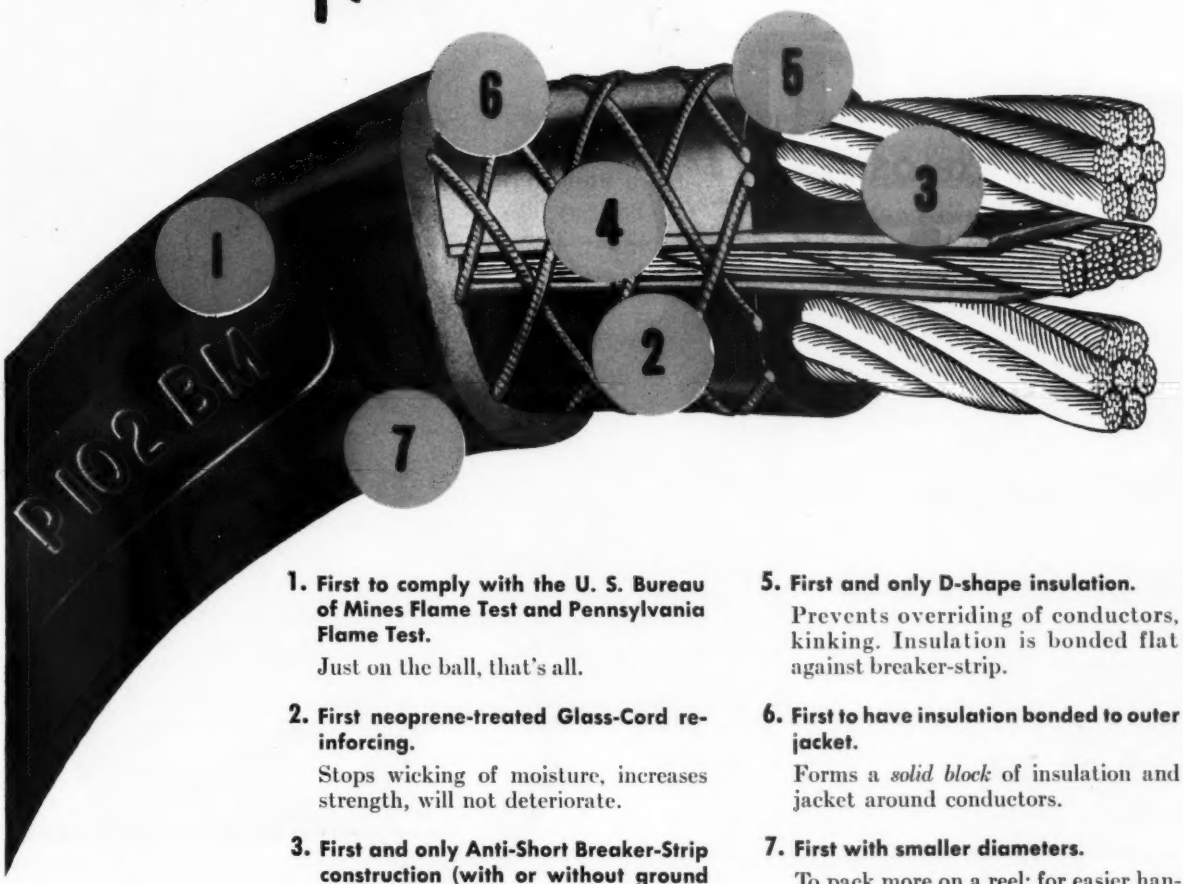
"PRE" sizes range from 400 to 3000 horsepower, and if you need smaller compressors, or another type of drive, Ingersoll-Rand has it . . . whatever it is.

Ingersoll-Rand also has the most modern line of rock drills, air tools, and other air-operated mining equipment. And remember, Air-Power equipment pays for itself nearly twice as fast today.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 339-1

Count the FIRSTS in Securityflex Cable



1. **First to comply with the U. S. Bureau of Mines Flame Test and Pennsylvania Flame Test.**
   Just on the ball, that's all.

2. **First neoprene-treated Glass-Cord reinforcing.**
   Stops wicking of moisture, increases strength, will not deteriorate.

3. **First and only Anti-Short Breaker-Strip construction (with or without ground wire).**
   Permits heavier impact.

4. **First parallel mine cable with ground wire.**
   Four years ahead of the industry.

5. **First and only D-shape insulation.**
   Prevents overriding of conductors, kinking. Insulation is bonded flat against breaker-strip.

6. **First to have insulation bonded to outer jacket.**
   Forms a *solid block* of insulation and jacket around conductors.

7. **First with smaller diameters.**
   To pack more on a reel; for easier handling. Now adopted by U. S. Bureau of Mines.

48454

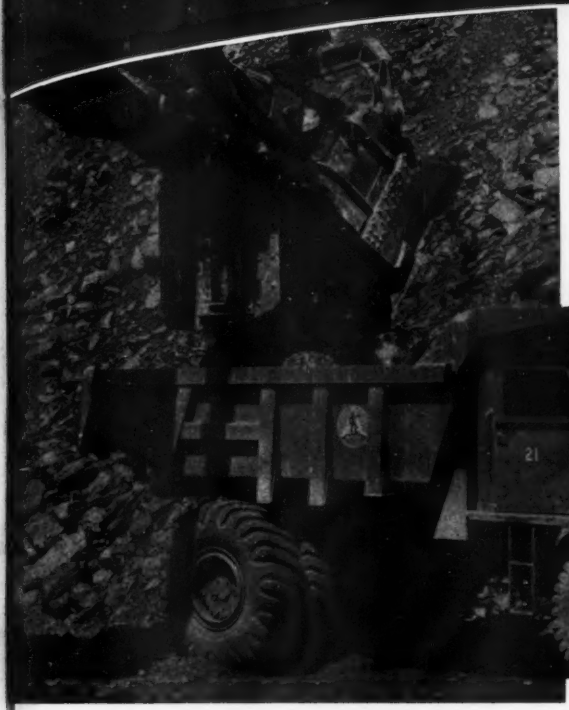
REMEMBER, ANACONDA RESEARCH AND ENGINEERING FACILITIES ARE AT YOUR SERVICE

Add to these basic *firsts:* the advantages of Anaconda mine cable's specially compounded, extra tough *neoprene* outer jacket . . . improved, heat resisting insulation . . . superior manufacturing techniques. Call the nearest Anaconda office to know how you can mine more tons per cable—with Securityflex.

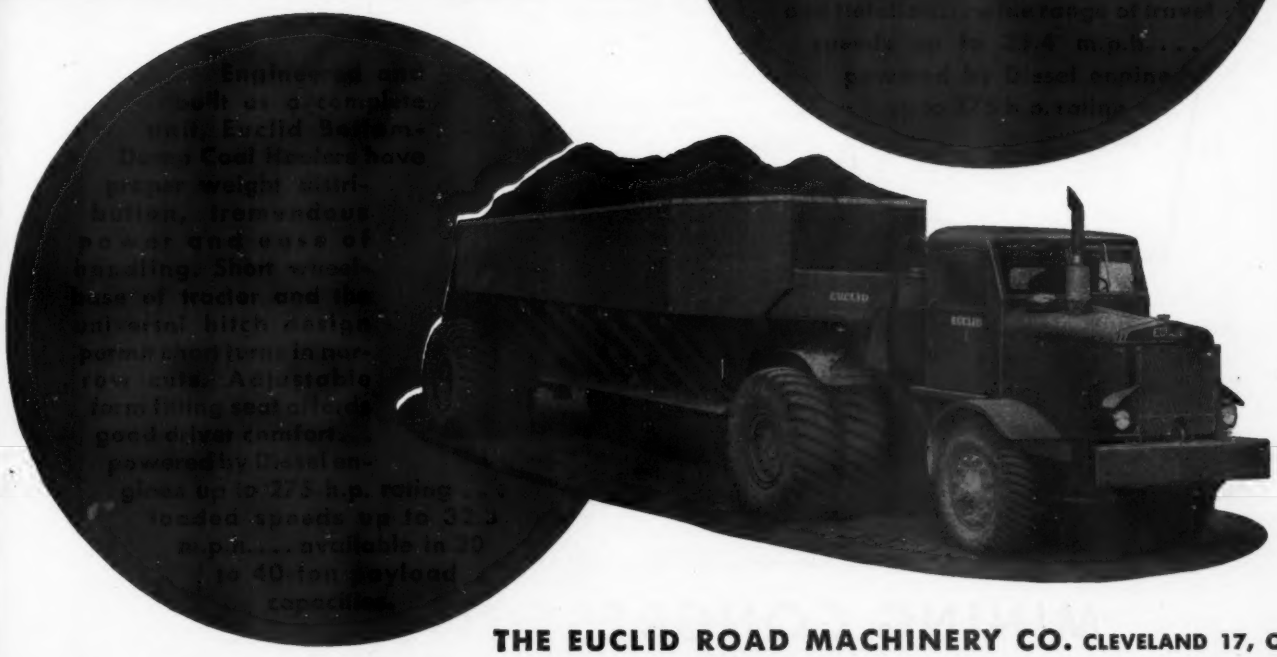
ANACONDA WIRE & CABLE COMPANY
25 Broadway, New York 4, N. Y.

ANACONDA *Securityflex* **MINE CABLE** ANACONDA

"EUCS" PACE SETTERS *for* PROFITS



For open pit mining operations, quarries, off-the-highway construction and industrial jobs, Euclids rate high in keeping hauling costs low. The simple, rugged construction and long life of "Eucs" make them first choice of many leading mine operators and contractors.



THE EUCLID ROAD MACHINERY CO. CLEVELAND 17, OHIO

EUCLIDS

IF YOU EMPLOY 100 PEOPLE OR MORE...

YOU CAN MAKE THESE YOUR *Success Stories!*

Payroll Plan for U. S. Savings Bonds actually increases worker production, as demonstrated in large and medium-sized companies throughout the nation. Here are some examples:

PAYROLL SAVINGS MAKES EMPLOYEES MORE CONTENTED

In General Motors' My Job Contest, approximately 15,000 GM men and women gave the Payroll Savings Plan as one of the reasons they like their jobs!

PAYROLL SAVINGS CUTS ABSENTEEISM

A survey made by a smaller company in Minnesota showed that during a recent three-month period employees not on payroll savings were absent almost 2½ times more frequently than those who were on the Payroll Savings Plan. Further proof that payroll savings cuts absenteeism!

PAYROLL SAVINGS REDUCES ACCIDENTS

Records at our eleven Navy Yards show that, as participation in the Bond program increases, accident frequency and accident severity decline. When participation at the Norfolk Navy Yard climbed to over 90%, accident frequency declined over 50%, and the accident severity index dropped to 1/6 its former level!

Hundreds of companies are reporting benefits like these! Obviously, they add up to increased production.

What's more, the Payroll Savings Plan is a powerful weapon against inflation. Every Savings Bond dollar built up in the Treasury retires a dollar of the national debt that is potentially inflationary. That's good for the country's future—which means it's good for *your company's* future.

And, of course, it's good for the employee's future, because the Bonds pay $4 at maturity for every $3 invested.

If your company has the Payroll Savings Plan, make sure you and your employees are getting the most out of it! If you haven't yet installed the Plan, you're missing something! For facts or help, call your Treasury Department's State Director, Savings Bonds Division.

The Treasury Department acknowledges with appreciation the publication of this message by

MINING CONGRESS JOURNAL

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and the Advertising Council.

WHAT'S NEW in OFF-HIGHWAY TRUCK DESIGN?

● You'll find the answer in Mack's new series of folders describing Mack truck models in payload capacities up to 55 tons.

These colorful, fully-illustrated folders give you complete, up-to-the-minute information on new developments in Mack super-duty truck design. They also describe the many outstanding and exclusive Mack features that assure lower costs and more profitable operation.

Before you buy any truck — in any capacity range — for pit or strip mining, for quarrying or other excavating work, it will pay you to get the facts on tough, dependable Macks.

Fill in the coupon below and we will gladly send you a complete set of these folders by return mail. No obligation on your part, of course.

IT'S PART OF THE LANGUAGE:

Built Like a *Mack* Truck

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Limited.

OFF-HIGHWAY AND MINING DEPT.
Mack Trucks, Inc.
Empire State Building, New York 1, N. Y.

Gentlemen: Please send me your five new folders describing Mack truck models for off-highway operation.

NAME_____

COMPANY_____

STREET ADDRESS_____

CITY AND STATE_____

# of wire rope

-may save you money

● Every user wants to get the best possible service out of his wire rope but it is amazing how often simple rules are broken in the field. Some operators are careless when installing a new rope . . . they keep machines running when sheaves are badly worn . . . they overload the rope . . . they forget to lubricate the rope.

To help eliminate these human failings, the American Steel & Wire Company maintains a staff of TIGER BRAND Wire Rope Specialists. These men are experienced field service engineers. If you have not checked your equipment recently, for correct wire rope application, call in the TIGER BRAND Specialist. He'll do the job for you without charge. Here are some of the points he checks before recommending the proper wire rope for your job—

1. Method of installing and caring for rope.
2. Diameter of sheaves and drums, and condition of grooves.
3. Arrangement of sheaves.
4. Fleet angles.
5. Loads handled.
6. Rope speeds, acceleration and deceleration.
7. Presence of vibration, whipping.
8. Lubrication.
9. Corrosion.
10. Amount of scrubbing and abrasion.
11. Fitting attachments.
12. Abuses to be corrected.
13. Analysis of service records.
14. Finally: Recommendation of the correct rope to meet all conditions.

To show you how you can save money on wire rope, we have prepared a booklet on proper wire rope application that every user of wire rope should read. You can get a copy by mailing the coupon.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

American Steel & Wire Company
Rockefeller Building, Dept. N-2
Cleveland 13, Ohio

Gentlemen:

Send me your booklet, "Valuable Facts about the use and care of Wire Rope."

Name.....

Position.....

Company.....

Address.....

SEND FOR NEW FREE BOOKLET

USS

AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

UNITED STATES STEEL

How Do Teachers Learn?

Here's how the Bituminous Coal Institute helps the people who instruct the nation's youth

Does teacher know the up-to-date facts about the bituminous coal industry? She (or he) should, but it's pretty hard to keep up with the latest developments.

To increase nation-wide understanding of our industry, the Bituminous Coal Institute advertises regularly in the magazines of the teaching profession. Through pictorial advertisements, teachers see for themselves how modern mining methods eliminate hard manual labor and increase efficiency. They learn how mechanization has helped to make the American coal miner easily the most productive in the world. They get the facts about coal miners' high wages.

To aid the teacher further, we offer two booklets—*Old King Coal Calls a New Tune!* and *Pertinent Facts about Coal*—free to any teacher who mails in the coupon our advertisements carry. So far we have given away—only in response to these written requests—almost a million such pamphlets.

A word from you may help this material reach the schools and teachers in your community. Your action will give this *national* program greater *local* impact.

other services—

Movies
Speakers Bureau **Women's Club Programs**
Newspaper Materials

NATIONAL in scope . . .
make them LOCAL in effect!

BITUMINOUS COAL INSTITUTE

A Department of NATIONAL COAL ASSOCIATION

Southern Building, Washington 5, D. C.

BITUMINOUS COAL . . . LIGHTS THE WAY . . . FUELS THE FIRES . . . POWERS THE PROGRESS OF AMERICA

660 TIMKEN®-equipped cars still going strong after more than 20 years' service

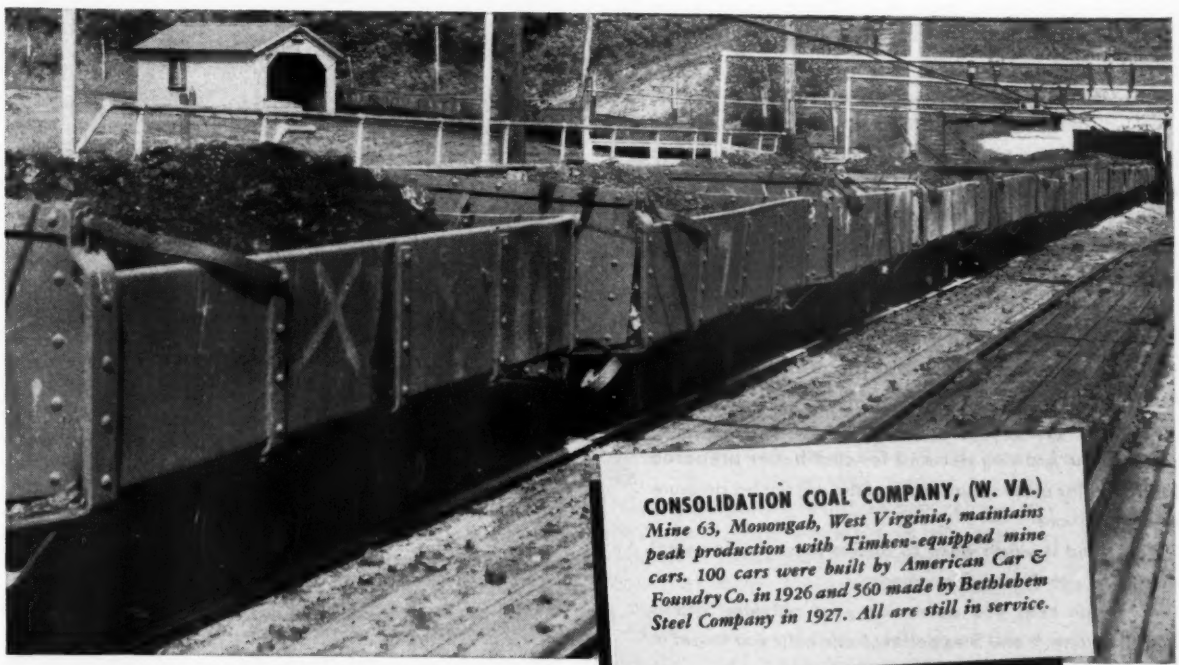
FOR over 20 years, 660 Timken® bearing equipped cars have helped Consolidation Coal Company (W. Va.) move maximum tonnage at minimum expense at their No. 63 mine. And these cars are still going strong!

Timken bearings on the axles permit easier starting, higher speeds, less power lost due to friction. They enable locomotives to haul more cars and more coal per trip. And they help keep maintenance expense at a minimum.

Due to their tapered design, Timken bearings take both the heavy radial and the severe thrust loads encountered on rough, winding mine tracks. They roll freely and frictionlessly under the toughest hauling conditions. Effective closures keep lubricant in, resulting in reduced time out for lubrication. Timken bearings are built to last as long as the cars themselves.

For peak production at minimum cost in your mine, get Timken bearings in every new mine car you buy. Look for the trade-mark "Timken" on the bearings you use. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



CONSOLIDATION COAL COMPANY, (W. VA.) *Mine 63, Monongah, West Virginia, maintains peak production with Timken-equipped mine cars. 100 cars were built by American Car & Foundry Co. in 1926 and 560 made by Bethlehem Steel Company in 1927. All are still in service.*

TIMKEN BEARING CAPACITY RATINGS INCREASED 25%.

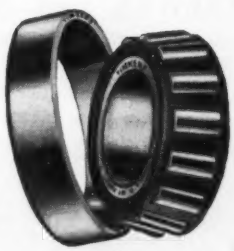
Since Timken bearings were last re-rated some 15 years ago there has been such a further and constant improvement in quality that we are now able to announce a 25% increase in radial and thrust-load carrying capacity. This may make possible the use of smaller bearings with savings in bearing cost, material cost and weight. Engineers will be able to utilize the advantages of Timken bearings in more applications than in the past.

A new Timken Engineering Journal, now in preparation, will give you complete capacity rating tabulations. For further assistance, write us today.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ⟶◫⟵ LOADS OR ANY COMBINATION ✳

All across the country
R & S-engineered coal cleaning plants
SPECIALIZE in SUCCESS!

In every coal producing area you find preparation plants engineered by Roberts and Schaefer Co.—each engineered to solve specific problems, each engineered to produce specific end-products. In general no two plants are alike, but there's one vital element common to them all: **they specialize in success.**

There's no accident about the presence of that specialty. Every plant is successful because it was intended to be, designed to be, built to be.

Pictured here are two coal cleaning plants in Western Kentucky—different in design and construction because each represented an individual problem; alike in their R and S pattern of success

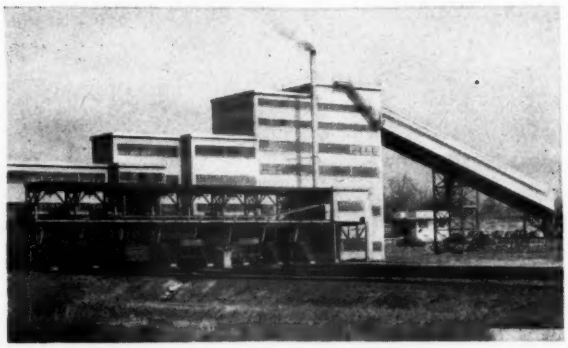
Consider your own plant—is it modern? economical? equal to the growing demand for coal better prepared for particular uses? secure against the increasing pressure of competition?

You'll find it worth while to discuss these fundamental questions with R and S engineers.

They can help you determine your potential profit, and show how R and S experience can help you to get it.

As a practical first step, write us.

W. G. Duncan Coal Co., Skibo Mine, Greenville, Kentucky



West Kentucky Coal Co., East Diamond Mine, Madisonville, Ky.

ROBERTS and SCHAEFER CO.

130 North Wells Street, Chicago 6, Ill.

2801 Broadway Ave.
PITTSBURGH 16, PA.

P.O. Box 570
HUNTINGTON 10, W. VA.

THESE INFORMATIVE BULLETINS TELL THE HOW AND WHY OF MODERN, AUTOMATIC R&S OPERATING EQUIPMENT. SEND FOR YOURS . . . TODAY

For dry cleaning fine coal R & S SUPER-AIRFLOW Bulletin No. 167

For washing coarse coal R & S HYDRO-SEPARATOR Bulletin No. 171

For washing fine coal R & S HYDROTATOR Bulletin No. 166

★ Mining CONGRESS JOURNAL ★

Published for the Entire Mining Industry
by the American Mining Congress
SHELDON P. WIMPFEN, Editor
FEBRUARY
VOLUME 35 1949 NUMBER 2

Sound Insurance

ATTEMPTS to amend and bypass the law of supply and demand have nearly always resulted in coloring many desirable items to the right shade to fit into a black market. Automobiles, meat and drink, and gold are among the many goods that have felt the painters brush and have been shaded the right tint to supply a portion of the demand. In foreign markets prices well in excess of $35 per ounce are being paid for gold—Gresham's law in action.

For altogether too long, we have had a law against holding gold which has not in any way diminished the urge to possess gold. Relatively small amounts of gold, that portion produced in the natural state as dust, nuggets, and flakes, may, under the provisions of the Gold Reserve Act, be held without a license. Thus those who have a firm belief in the value of gold may hedge fluctuations in the purchasing power of irredeemable paper currency.

As the supply is inadequate, the price is higher. A New York firm recently stated its readiness to offer natural gold in 100-oz lots at $39.50 per troy ounce of material 850 fine. Those whose trust in gold is strong, a continuation of the confidence that has existed for several thousand years, have an opportunity to support their beliefs and store up value which will not depreciate.

Making Headway

JUSTIFIABLE PRIDE may be taken by the mining industry in the mineral production of 1948. The material requirements of the people have been filled by judicious use of natural resources plus human energy, multiplied by the tools of production. The gap between supply and demand has in most cases been narrowed, and great strides have been made in preparation for the future.

On the pages of this annual review issue are set forth the accomplishments of many important segments of the industry. In general it may be seen that there is an active movement to find new sources of raw materials, and to expand production from existing ones. Techniques and practices already in use are being polished and new equipment is being provided to further multiply man's energy.

During 1948 the mining industry applied three-quarters of a billion dollars for new plant and equipment, and it is likely that a similar sum will be spent in 1949. Without a doubt, even greater funds would be made available for expansion were it not for the heavy tax burden that the industry is struggling under.

Capital expenditure, although at a high rate, is low in relation to the opportunities presented by the national market of 148,000,000 people. Although we lead the world in the possession of the means of better living, certainly greater production and industrial efficiency are indicated in order to provide the goods and services for a steadily improving standard of living.

In coal production we have met all needs with an ample supply, but plans for future developments of the country indicate that the annual tonnage of coal produced must rise in the years ahead. Additional supplies will be needed to fuel projected utility plants, to provide the raw materials for synthetic fuel operations, and to supply the requirements of a growing population.

Copper reserves are as large today as they have ever been. Lead and zinc production is below the peak. Consumption of these important nonferrous metals increases annually as does the difficulty of replacing reserves under present economics.

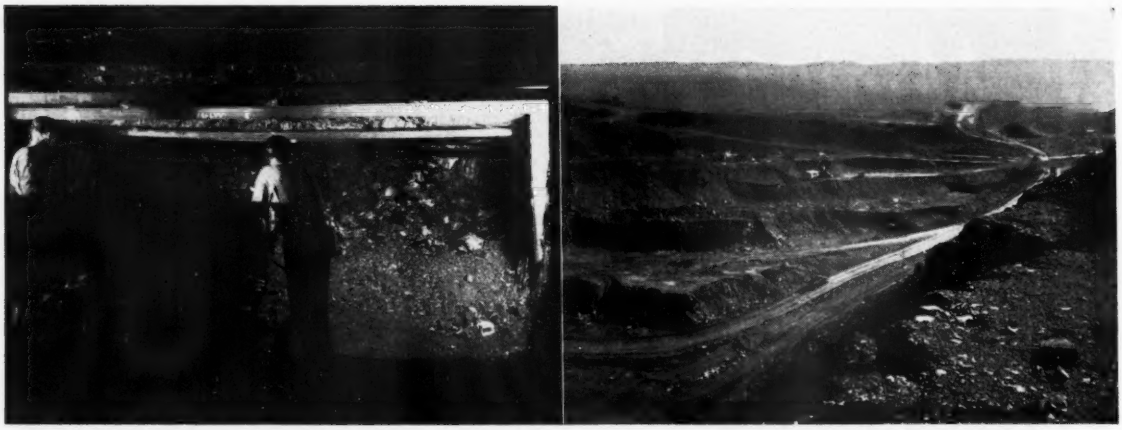
Demand for steel and iron products by the people of the United States continues to edge higher although already our per capita consumption is the world's highest. Last year saw peacetime shipments of iron ores that were only exceeded in one war year. The question of long range adequacy of domestic supply rests upon the economic and technical success of beneficiation of extensive reserves of lower grade ores.

Ferroalloys and other strategic metals face varying problems. The deficiency of manganese would be aggravated by the halting of shipments from Russia. The situation with respect to these essential minor metals differs but, in general, greater tonnages than have been available in the past are needed. Titanium looms as an industrial metal of considerable importance and plans for producing plants are going forward.

Aluminum production fell short of demand but the supply of magnesium was more than sufficient.

With respect to certain nonmetallic minerals there have been shortages, but supplies of most of them have been sufficient to meet the majority of demands.

As the years go by the mining industry is called upon to supply its products in steadily increasing quantities. Through exceptional effort and with the measure of cooperation that has been achieved between labor, management, capital, and government, the record looks good. Provided better understanding can be reached among these vital components of American industry and that incentives to production are not limited, the mining industry can be relied upon for the raw materials with which to build a great future.



All phases of coal operations—from bituminous deep mining to anthracite stripping—will be discussed at the Convention

1949 Coal Show

At the Public Auditorium, Cleveland, Ohio, May 9-12

EVERY PROGRESSIVE operator, manufacturer, and supplier in the coal mining industry is looking forward to the 1949 Coal Show in Cleveland. The Exposition this year will be the largest ever assembled; there will be plenty to hear, see, and talk about every minute for the full four days. Exhibits will open at 8:30 a. m. on Monday, May 9, and at 9:00 a. m. on the following days; closing time each day will be 5:00 p. m. Two half-days —Monday morning and Thursday afternoon—have been left entirely open, without any scheduled meetings so as to afford ample time to visit all displays. Convention sessions are conveniently arranged so that visitors may divide their time to give attention to exhibits and the meetings.

Coal mining is at the beginning of a new era. The industry profiting by the experience gained over the past 20 years in changing from hand to machine methods, is now beginning to take full advantage of its opportunities. The Convention at Cleveland will give accounts of progress already under way, covering the major developments in operating practices, equipment design, coal marketing, management problems, personnel training, and the promotion of safety. Papers and discussions will be presented by practical men—operators, executives, engineers, and manufacturers—representing a cross section of the industry fully conversant with the details of past and current industrial developments and the trends indicated for the future. Their presentations will bring to the Convention the most up-to-date methods of the industry, as well as its best thought and experience.

The Exposition will be more than 40 percent larger than the record-breaker of 1947 and almost three times greater than the prewar shows in Cincinnati. Exhibits of 213 leading manufacturers will feature every type of machine, auxiliary equipment, tools, and supply items for coal mining. Most of these—large and small—will be on the floor for detailed inspection, study, and comparison with others. Operating characteristics and performances data, as well as application to particular conditions, can be discussed in full detail with the manufacturers.

Advance Registration

An innovation at the Coal Show this year will be a streamlined method of advance registration. Notices will be sent out shortly to coal companies advising them of the advance registration plan and asking them to send in a list of their own men who will attend. Each of these men will then receive by mail his "Coal Show Credentials," consisting of a card which, upon presentation at the main entrance, will admit the bearer to the Coal Show without delay. Watch for further details in later Coal Show announcements. Be sure your name is sent in ahead of time; and then, don't forget to bring your Coal Show Credentials to Cleveland.

Hotel Accommodations

There will be plenty of accommodations in Cleveland for all those wishing to attend the Coal Show. Some of the principal hotels are already booked to capacity, but Cleveland is well supplied with other good hotels which are suitable for convention visitors, some in the downtown area and others conveniently located in nearby suburban areas. The full facilities of the Housing Bureau are now engaged in handling requests for accommodations, and this will continue right up until the opening day of the Coal Show. If you do not have a confirmed reservation, write, wire or phone promptly for your accommodations to Miss Louise D. Perkins, Director, Housing Bureau, 511 Terminal Tower, Cleveland, Ohio (telephone: Main 4110).

Entertainment

The well-known friendliness and good fellowship of coal mining men will be at its peak when they convene in Cleveland, and there will be occasions when they can all join for a bit of relaxation and sociability. Some enjoyable entertainment functions are being arranged, and this year these will be held in the Arena at the Public Auditorium, where a large crowd can be accommodated.

The Convention will open with a Welcoming Luncheon at 12 noon, Monday, May 9. This will be the first informal get-together, and an outstanding speaker will discuss some of the important problems which the industry faces. The Coal Miners Party will be held at 7:00 p. m., Tuesday, May 10; this will start with a buffet dinner, followed by an evening of entertainment, dancing, and fun. The Annual Banquet will be at 7:00 p. m., Thursday evening, May 12. There will be only brief introductions of honor guests and the speaking, if any, will be strictly limited. A fast-moving entertainment program will bring the meeting to its close.

Ladies are cordially invited to all entertainment functions, as well as to see the exhibits in the Exposition. There will also be special entertainment arranged for them.

Preliminary Program

MONDAY, MAY 9

12 Noon—Welcoming Luncheon

OPENING OF CONVENTION

2:30 pm—Trackless Mining

A Symposium on Continuous Mining
GERALD VON STROH, Bituminous Coal Research, Inc.
Further Speakers to be Announced

Tractors and Trailers for Supply Haulage
G. O. TARLETON, Consolidation Coal Co. (Ky.)

Various Methods of Belt Conveyor Loading
A. E. LONG, Clearfield Bituminous Coal Corp.

2:30 pm—Maintenance-Ventilation

Maintenance of Underground Equipment
W. F. DIAMOND, Marianna Smokeless Coal Co.

Maintenance of Preparation Plant Equipment
H. D. BOWKER, West Virginia Coal & Coke Co.

Auxiliary Ventilation
R. G. HEERS, Kaiser Co. Inc.

TUESDAY, MAY 10

10 am—Utilization and Marketing

National Fuels Reserve and Future Fuel Supplies
ARNO C. FIELDNER, U. S. Bureau of Mines

Trends in Consumer Demand
GEORGE A. LAMB, Pittsburgh Consolidation Coal Co.

Depreciation Allowances in Relation to Capital Required for New Plants and Equipment
T. H. BIERCE, Rochester & Pittsburgh Coal Co.

2:15 pm—Face Operations

High Speed Cutting and Drilling With Tungsten-Carbide Bits
CARL BURGENER, Peabody Coal Co.

Various Methods of Breaking Down Coal at the Face
W. O. SMITH, Luzerne-Graham Mining Corp.

Use and Care of Trailing Cables
C. C. BALLARD, The New River Co.
E. W. DAVIS, Simplex Wire & Cable Co.

2:15 pm—Strip Mining

Recent Developments in Overburden Drilling
HOWARD FRISBIE, Broken Aro Coal Co.

Blasting in Open-Pit Mining
(a) With LOX—
DON B. MCCLOUD, Airmite-Midwest Corp.
(b) With Fixed Explosives—
A. B. AUSTIN, Hercules Powder Co.

Deep Stripping Methods
(a) Tower Excavator—
HAROLD HICKS AND HOWARD TRUAX, Truax-Traer Coal Co.
(b) Large Shovels—
ANDREW HYSLOP AND RUSSELL MCHUGH, Hanna Coal Co.

TUESDAY EVENING—COAL MINERS PARTY

WEDNESDAY, MAY 11

10 am—Surface Preparation

Dewatering and Drying Coal
(a) Methods and Equipment for Washed Coal—
ORVILLE LYONS, Battelle Memorial Institute
(b) Heat Drying Raw Slack—
J. C. JOHNSTON, Eastern Gas & Fuel Associates
(c) Effect of Moisture on Surface Screening
WM. R. CALER, Enos Coal Mining Co.

Dense-Media Separation Processes
HARRIDON RANDALL, Rhoads Contracting Co., and EDGAR SCHWEITZER, Lehigh Valley Coal Co.

2:15 pm—Underground Haulage

Locomotive Trip Dispatching by Telephone and Radio
FRANK EUBANKS, Old Ben Coal Corp.

Latest Developments in Belt Haulage
CAREL ROBINSON, Consulting Engineer

Shafts vs. Slopes for Hoisting
PAUL WEIR, Paul Weir Co.

2:15 pm—Strip Mining

Current Anthracite Stripping Practices
CHARLES E. BROWN, Philadelphia & Reading Coal & Iron Co.

Contour Mapping by Aerial Photography
GEORGE HESS, Aero Service Corp.

Practices in Open-Pit Power Distribution
JOHN HUEY, United Electric Coal Cos.
DAVID STOETZEL, General Electric Co.

Stripped Land Regeneration
A. G. CHAPMAN, Central States Forest Experiment Station

2:15 pm—Steep Pitch Mining

A Round Table Discussion—
Speakers to be announced.

THURSDAY, MAY 12

10 am—Management

Improving Management-Employe Relations
Speaker to be announced.

Management-Employe Responsibility for Mine Safety
CHARLES W. CONNOR, Armco Steel Corp.

Attracting Young Men to the Coal Industry
HENRY C. WOODS, Sahara Coal Co.

AFTERNOON—Open for Inspection and Study of Exhibits

EVENING—ANNUAL BANQUET

JOY-AMSCO SLUSHING SCRAPER

Equal TO YOUR TOUGHEST JOB

Have you checked the Joy-Amsco slushing scraper point-for-point? You'll find it's designed in detail to meet every abusive condition that a mucking job can present. And design is backed up by making all parts of Amsco Manganese Steel . . . the one super-tough steel that gets more wear resistant, the more battering your work imposes. Before you buy, obtain all the facts on the Joy-Amsco slushing scraper. It's built to haul bigger loads, to dig-in faster, and stay on the job longer.

FOUR TYPES . . . TWENTY-EIGHT SIZES

Joy-Amsco slushing scrapers are built as standard or one-quarter box, half, full, and hoe type scrapers. Each type is available in seven sizes from 36" to 72".

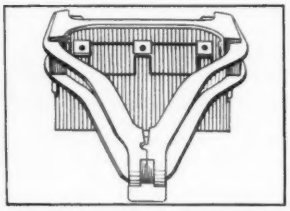
FOR COMPLETE INFORMATION WRITE

JOY MANUFACTURING COMPANY

PITTSBURGH • PENNSYLVANIA

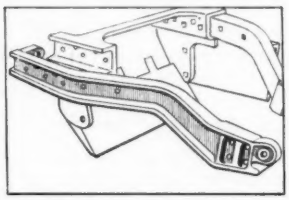
or the Joy regional office nearest you

DESIGN FEATURES



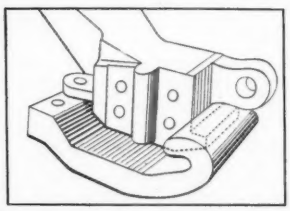
OPEN YOKE

. . . no cross bars to hang on large boulders and lift scraper off load



TAPER FIT

. . . puts tug load on arm and body castings — takes stress off bolts



SHOE KEY

. . . locks position of arms at front —prevents misalignment of arms under load

INTERLOCKING FITS

. . . provide one-piece rigidity. Wherever castings join, such as lip and body, taper joint design interlocks scraper into a solid unit

BOLT GUARDS

. . . all bolts are either recessed in or shielded by protecting ribs . . . eliminating peening or other damage in use

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION

CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., Oakland, Calif., Los Angeles, Calif., St. Louis, Mo.
Offices in principal cities. In Canada: Joliette Steel Limited, Joliette, Que.

Annual Review and Forecast

Economics of Bituminous Coal Mining

By GEORGE A. LAMB
Manager of Business Surveys
Pittsburgh Consolidation Coal Co.

IN 1948 the bituminous coal industry mined approximately 590,000,000 tons according to preliminary reports.[1] It was the second best peacetime production although 40,000,000 tons under the all-time record output of 1947.

Production has been at a remarkable rate since War II. During the three years, 1946 to 1948, it averaged 585,000,000 tons compared to an annual average of 400,000,000 tons in the 1935-39 period.

The 1948 production started at the record 1947 pace but was soon impeded by severe winter weather and transportation shortages, and then interrupted by the March suspension. Following the resumption of operations in mid-April, production rebounded to a peak level where it remained through June. In July, starting under a new wage contract after the miners' vacation, it was at a comparatively good rate until late August but began to decline thereafter as supply availability finally had been pushed in excess of a market that had commenced to shrink earlier in the year. Contributing to the late-year supply situation was a relatively warm fall.

Declining Exports Cause Market Change

Around half of the 1948 market drop is traced to a change in export volume. Ordinarily, most of the American coal exports move to Canada and the remainder to other North and South American countries. But with battered mining facilities in Europe and elsewhere following the war, there was a world coal shortage and heavy demands were put on America for tonnage which was to be handled primarily on a relief basis. Bituminous exports reached a peak in 1947 when a total of 69,000,000 tons were shipped, 40,000,000 tons going to points outside the American continents. There also were exports of other solid fuels: Anthracite of 9,000,000 tons, about half billed to Europe; coke and briquets of 1,000,000 tons but with relatively little destined overseas. In 1948, exports dropped with apparent improvement in foreign mining operations. During the first eight months of that year compared with the similar period of 1947,

[1] Figures from U.S. Bureau of Mines reports unless otherwise indicated. Lignite tonnage is included and represents about one percent of the total.

bituminous exports to non-American continents were cut by one-half and there is some question whether they would quite reach 20,000,000 tons for the 12 months. At the same time, they had a decline of only 1,000,000 tons to North and South American points. Similarly, anthracite lost about half of its overseas market but otherwise was doing as well. Coke and briquets had but small change.

BITUMINOUS COAL DISPOSITION, 1947-48 (Million Net Tons)

	1947	1948 P
Railroads (all classes)	113	102
Coke and steel	119	120
Retail yards	88	90
Electric power utilities	90	102
Manufacturing & miscl.	152	129
Total to American points	562	543
Exports	69	47
Total disposition	631	590

P—Preliminary.

Various changes in American purchase accounted for the remainder of the bituminous market decline in 1948. Railroad fuel orders were down ten percent mainly because of Diesel installations. Coke and steel worked at capacity but acquired slightly more tonnage to improve upon its stock position. At the same time, electric utility buying advanced ten percent while retail yards added two percent in tonnage to balance their stocks. These four groups—railroads, coke and steel, electric utilities and retail yards—taking 75 percent of the tonnage together, increased their purchases by 4,000,000 tons over the year. Remaining is the manufacturing and miscellaneous group which reduced its coal buying by 23,000,000 tons although most of its representation was as active business-wise as in the previous year. It is a catch-all group that consists principally of manufacturing concerns but includes other fields such as the bunker trade and that part of the retail business served by direct truck deliveries from the mines. What segments of the group reduced their purchases because of a switch to other fuels, greater efficiency in the use of coal, drawing upon stocks, or for other reasons, cannot be determined satisfactorily from the sketchy information available.

PROPORTION OF CLASS I STEAM RAILWAY FREIGHT AND PASSENGER TRAFFIC PROPELLED BY DIESEL LOCOMOTIVES, FIRST NINE MONTHS, 1947-48

	Freight, Gross Ton-Miles		Passenger Train, Car-Miles	
	January 1947	September 1948	January 1947	September 1948
United States	11.8%	20.0%	25.6%	38.7%
Eastern District	6.7	14.8	14.1	29.4
Pocahontas Region	0.06	0.05	4.1	7.7
Southern Region	20.2	25.9	50.4	57.1
Western District	15.2	25.7	28.7	42.8

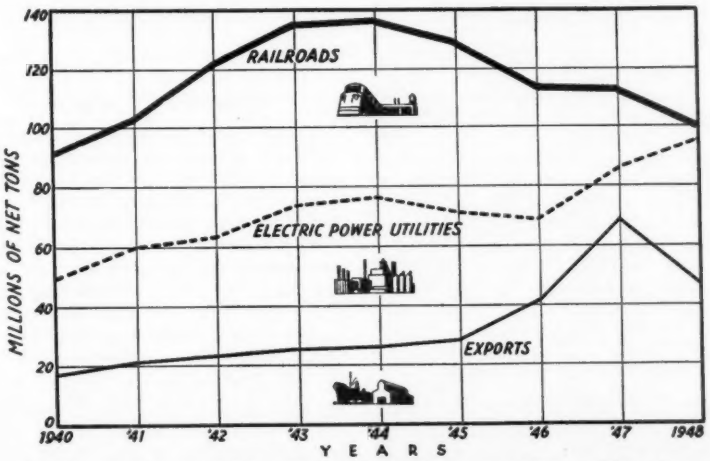
SOURCE: ICC Reports.

Impact of Research Developments Will Effect Expansion of Future Demands

Coal Use for Railroad Fuel Declines

Railroads made rapid strides in their Diesel program during the year. Diesel oil purchases, 50 percent above 1947, fueled a growing number of new locomotives in all branches of service throughout the country. They will total about 1.2 billion gallons for the year, roughly equivalent to 50,000,000 tons of coal. Although they principally affect coal consumption, Diesels also have displaced a number of steam locomotives that burned fuel oil.

Railroad Dieselization, started in the early thirties, was but of modest proportions except for certain areas as late as 1945. Currently over the country, however, Diesels handle 35 percent of the switching, 20 percent of the freight haulage and 39 percent of the passenger traffic. In the Eastern railroad district, where half of the locomotive coal is burned, Diesels were installed at a faster rate than elsewhere in 1948, although this area still is behind the South and West in the use of this kind of locomotion.



Bituminous coal consumed by railroads and electric power utilities and bituminous coal exported from the United States, 1940-1948

Coke and Steel

The coke and steel group, continuing at capacity operations had little change in its coal consumption but some addition to stocks as against last year. There was a tendency for a small drop in beehive output as new byproduct oven capacity was added.

Retail Yards

Shipments to retail yards have remained at good levels since the war. Oil and natural gas offered greater competition during 1948 than they had since the prewar days but their success has been in new business more than in capturing coal accounts. Following the tight coal market of 1947, retailers were able to obtain a better balance in supply through increased purchases.

Electric Utilities Increase Coal Use

Bituminous shipments to electric utilities continued to increase and appear headed for substantially higher levels in the years ahead. They will total approximately 100,000,000 tons in 1948 and may reach as much as 150,000,000 tons ten years hence. Electric utilities are fast becoming the major coal consuming group.

Utility plans released during the year show that, in the area where coal is the main fuel for electric generation, prospective expansion calls for steam plants except in a few minor cases. This area, which includes the major part of the industry and population, stretches from the Missouri River to the Atlantic coast, extending into the South Atlantic States.

Consumer Coal Stocks

Stocks were improved among the major consuming groups with the likely exception of certain categories in manufacturing and miscellaneous. Electric utilities made the largest gain, adding 8,000,000 tons to their plant reserves. The declining market plus a warm fall made tonnage available for extensive stocking for the first time since the early part of War II and many consumers took advantage of the situation by acquiring much more tonnage than most expected they would. Total stocks were listed at 70,000,000 tons on December 1, 1948, an increase of 19,000,000 tons over the same time in 1947.

Coal Prices

Available price data on fuels for 1948 are too limited to afford other than broad comparisons. The US Bureau of Labor Statistics periodic listings on bituminous coal, fob destination, indicate that the average price in 1948 was $8.07 per ton, 18 percent higher than it was in 1947. Since the Bureau's price sample is furnished by established companies, it fails to reflect the exceedingly high prices obtained upon marginal coals in 1947 and thus the drop in such prices when the market declined in 1948.

As against the bituminous price, Bunker C fuel oil in 1948 averaged $3 per barrel in New York Harbor, 32 percent above 1947 according to trade journal reports. Its price dropped to $2.80 by year end. Diesel oil purchased by the railroads in 1948 was around 10c per gallon, 37 percent over the previous year. There were changes in the rates on natural gas but they dealt mostly with relationships, or particular areas, and had little effect on the general level as has been the case for some years.

Marginal Mining

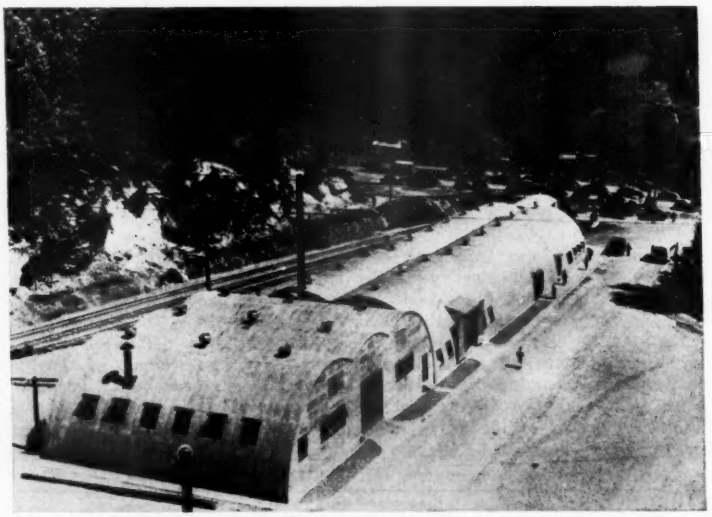
The 631,000,000 tons of bituminous produced in 1947 represented an increase of 117,000,000 tons over the 514,000,000 tons mined in 1941. But between the same years, strip tonnage advanced from 43,000,000 to 139,000,000 tons, a jump of 96,000,000 tons or most of the increase in total production. In addition, there were expansions in production through truck mining and various kinds of temporary operations. Much of the increase attributed to strip, truck, and temporary mines, is classified as marginal tonnage which had ready buyers during the tight war and postwar markets. Demand for the marginal output weakened quickly once the 1948 market decline was in evidence.

Regardless of market, marginal mining would be on a gradual decline because of the exhaustion that has taken place among the coal deposits suitable for the operations involved. Looking ahead, coal will have to be supplied more and more by full-scale deep and strip operations.

Operating Efficiency Improves

Improvements in productivity continued in 1948, following a trend that has prevailed in American coal mining since its earliest days. Moreover, a substantial part of the 1948 earnings was put back in the industry in the form of modernized plant and equipment, which assures further efficiency gains to be realized.

In 1947 bituminous output per man-day was 6.42 tons, a composite representing 5.49 tons for underground mines, and 15.93 for the strip mines which produced 22 percent of the total tonnage. As to the underground mines, 60.7 percent was mechanically loaded with an output per man-day estimated at 6.5 tons compared to 4 tons for handloaded production. In 1948, underground productivity increased because of added mechanization and some decline in handloading. Strip operations maintained their productivity but, with shrinkage in output and possibly in relative importance, may have prevented a rise in output per man-day for total mining. Coal's excellent performance was achieved in spite of a cut in working time of over an hour daily, taking place in July 1947, and effective throughout 1948.



Modern surface buildings at Consolidation Coal Co. (Ky.)

A Better Product

Large expenditures were made in 1948 on preparation plants to provide a mechanically cleaned and otherwise a better processed product. In 1947 as against the previous year, total production increased 18 percent but mechanically cleaned coal advanced 26 percent. Considering that a good part of the 1947 production increase came from marginal operations, the progress in preparation by the equipped mines was greater than the figures indicate. In 1948, with the shrinkage in marginal output and heavy expenditures on preparation plants, the growth in mechanically cleaned tonnage was more apparent.

Research Advances

Research in coal took on momentum in 1948. It received added impetus from a growing recognition that the longer-time outlook on fuels points to new responsibilities for coal. This recognition received concrete expression in a speedup of research into the mining, preparation, and utilization of coal as well as in the processing of oil from coal.

Research on synthetic oil and improved gas production was promoted in various ways during the year. Pittsburgh Consolidation Coal Co., in conjunction with Standard Oil Development Co., completed a pilot plant for advanced research on coal gasification. The Koppers Co. and Gulf Oil began working together on similar projects, besides research being done by various oil and other companies.

Bituminous Coal Research, Inc., the national research agency of the bituminous coal industry and the country's largest association research agency, was also active on studying the technological and economic aspects of the production of gas from coal, and began projects to develop improved gas producers. Its activities included studies on hydrogenation. The U.S. Bureau of Mines opened its synthetic liquid fuels laboratories and pilot plants at Bruceton, Pa., and completed a large part of the work necessary at Louisiana, Mo., for the coal hydrogenation pilot plant which will be opened in May 1949.

Because of the national defense aspects of synthetic fuels research and development, the government proclaimed the need for development of a synthetic fuels industry and proposals were made in Congress to start such an industry in advance of its commercial feasibility by building large-scale plants through government financial assistance. These legislative proposals, on a scale involving hundreds of millions of dollars, were given wide publicity but failed to move beyond a preliminary stage.

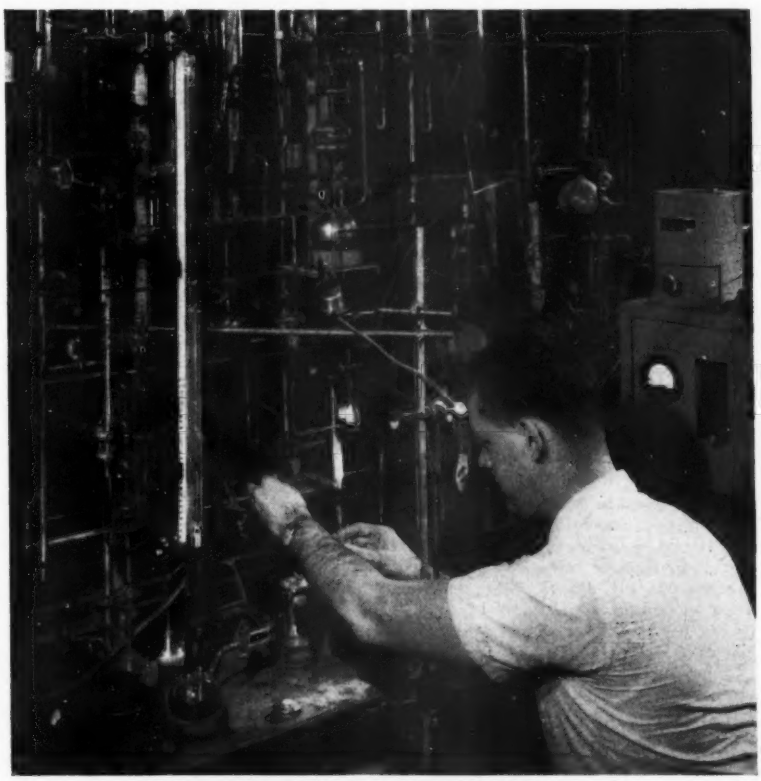
Although outshadowed by the synthetic fuels research which marketwise will not likely have an impact until several years have passed, other research of a less spectacular nature was going on which may have a more immediate influence on the industry. BCR continued its work on locomotives, both as to development of a coal-fired gas turbine and as to a better performance from steam locomotives. The Bureau of Mines cooperated with BCR in this research through lending a gas turbine to facilitate the research. BCR research in domestic heating continued, and manufacture of BCR-developed smokeless heaters began. This and related developments may have considerable importance in the retail trade.

In 1948 BCR also developed a method for curing tobacco with coal which will add a moderate tonnage to the coal markets. Researches were also carried out on the combustion of pulverized coal. Coal carbonization was under active study by BCR, and Pittsburgh Consolidation intensified its researches into low-temperature carbonization. This increased interest in research was associated with a material expansion of the "Disco" operations near Imperial, Pa., with a new plant designed to produce about 300,000 tons of "Disco" a year.

The Bureau of Mines stepped up research activities in the coking properties of coals and explored the possibilities of blending coals to stretch coking coal reserves. The Bureau also became active in its research on the utilization of lignitic coals for steam purposes. These researches have potentially a rather immediate impact on markets in the Southwest as lignite is readied to supplant natural gas which may be reserved for higher uses.

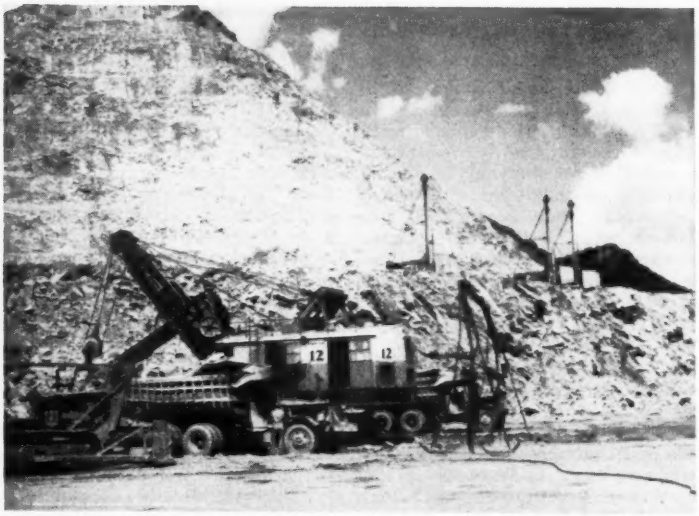
In the realm of mining technology 1948 was notable as two separate companies announced continuous mining machines. One machine type was demonstrated by actual operation in 13 mines. It is to be expected that practical knowledge will be accumulated for the improvement of design and operation. Meantime, BCR began a program for developing improved continuous mining methods and equipment. The importance of successful practice on continuous mining to the bituminous coal industry and its ability to hold and expand markets through lowering costs need not be elaborated upon. Research on mine safety and mine drainage also were pressed.

Generally speaking, it may be said that while research actually completed in 1948 is already expanding coal markets or will soon begin to expand them, the longer-range implications of applying modern research methods to the coal industry, a move which was given great impetus in the year just ended, provide stronger than usual basis for optimism as to the future of the coal industry.



Testing gasoline produced by the Fischer-Tropsch process

Outlook For Nonferrous Metals



In 1948 Castle Dome in Arizona extended its reserves of low-grade copper ore

Per Capita Consumption High as Population Rises

By SIMON D. STRAUSS
Manager of Sales
American Smelting and Refining Co.

IN THIS analysis of the nonferrous metals, statistics are being held down to an irreducible minimum. The volume of statistics available in the nonferrous industry is so large and diverse that one can usually find a set of figures to cite in support of almost every theory.

It would appear that the present status of the industry is most clearly revealed in comparison with its status a decade ago, eliminating the intervening war years when conditions were clearly unusual. Therefore, the statements which follow contrast the three years, 1936 through 1938, with the three post-war years, 1946 through 1948. The 1936-38 period was the most active in the decade of the thirties, a decade which is generally identified as having seen the most prolonged and severe depression of modern times. Nevertheless, in 1936-38 production and consumption of nonferrous metals in the United States were close to the highest rates of the twenties, while outside this country production and consumption were both at all-time record levels.

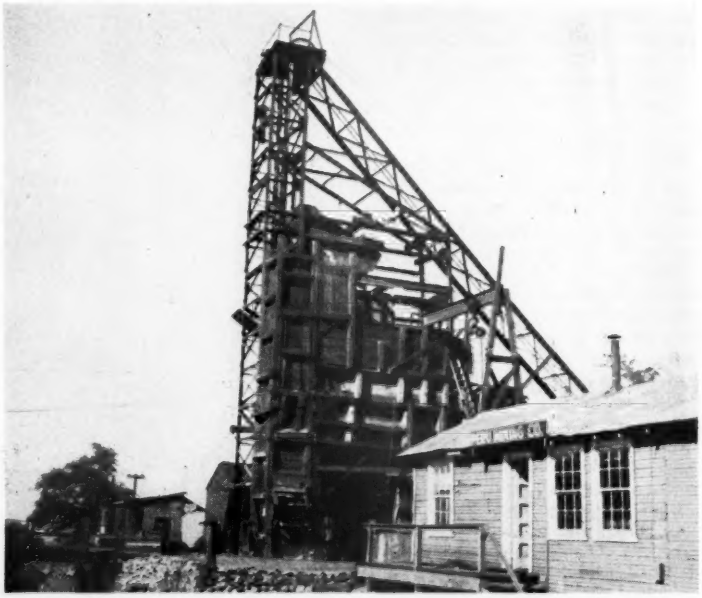
A few basic figures for both 1936-38 and 1946-48 have been compiled and are shown in the accompanying tables, the 1948 figures being my own estimates and all others being derived from a single source—the yearbook of the American Bureau of Metal Statistics.

Viewed in the perspective of 13 years, the following appear to be the major trends in our industry:

(1) The United States mine production of copper and zinc during 1946-1948 has been measurably greater than during 1936-1938. The United States mine production of lead during 1946-48 has been somewhat less than during 1936-38. It is a fair conclusion that in terms of volume the mining industry of the United States did not lose ground during the war but actually gained ground.

(2) The United States today is the world's largest mine producer of copper, lead, and zinc. Its mines have held this position consistently for more than 30 years. No nation with a mining industry which has consistently outranked the mining industries of all other countries in the world over so long a period can properly be classified as a "have not" nation.

(3) The U.S. Bureau of Mines, after a careful survey of the known reserves of copper, lead, and zinc in the United States, estimated some time ago that these are adequate to maintain production for



Zinc production from the mines of the Silver City District, N. M., is increasing

15 to 20 years at current rates. These estimates have caused some uninformed analysts to conclude that the domestic nonferrous metals industry, which first attained large volume a century ago, is doomed to early extinction. However, had the Bureau of Mines made a similar survey in 1925, its conclusion then would likewise have been that known reserves were adequate only to maintain production for 15 to 20 years. At no time have known reserves of copper, lead and zinc in this country been measurably greater than at present. It is obvious that we will develop additional reserves with time, although future discoveries presumably will largely be the result of new methods of prospecting, rather than the development of surface outcrops. In the last 20 years, furthermore, the bulk of the new ore developed has been in established districts rather than in new areas. Ira Joralemon in a paper presented to the AIME in February 1948, listed the numerous developments that are maintaining the over-all reserves position of this country. It is an impressive list.

(4) In the 1936-38 period the United States was an exporter of copper, an importer of lead, and was roughly self-sufficient in zinc production. In the 1946-48 period it was a large importer of all three metals. This pronounced change in our self-sufficiency, however, was not due to a drop in production. As has already been stated, production of copper and zinc has increased and production of lead has receded only moderately. The reason that we are no longer self-sufficient is that consumption has risen to an amazing degree—by 100 percent in copper, by 50 percent in zinc, and by 40 percent in lead.

(5) There is a feeling among some mining men that if the Government would only cease pampering foreign producers of metals and extend to our own industry necessary assistance in the form of tariffs, or subsidies, or loans, the mines of the United States could readily produce all the metal that this country needs. This is, however, a much larger order than apparently is generally realized if consumption continues at its present rate. It means increasing the volume of present production by 400,000 tons of copper, 300,000 tons of zinc, and 300,000 tons of lead per year. It means an expansion in effective capacity of about 50 percent each in copper and zinc and of 75 percent in lead. Increases of this magnitude require not only enormous new ore developments and large amounts of capital, but a great deal of time as well. As an example, one can cite the extensive San Manuel copper deposit in Arizona, which has been under aggressive development for three years but which, it is understood, is not likely to be in production for at least another five years. Thus, even if we now had developed the ore resources to justify expansion of copper and zinc capacity by 50 percent and of lead capacity by 75 percent, it seems improbable that this could be effectively accomplished in less than five to ten years. And since present developed ore resources are

PRODUCTION AND CONSUMPTION OF COPPER, LEAD, AND ZINC

(All figures in thousands of short tons of primary metals)

COPPER

Year	Mine Production		Primary Consumption	
	In U.S.	Outside U.S. (a)	In U.S.	Outside U.S. (b)
1936	615	1,099	678	998
1937	835	1,518	722	1,155
1938	557	1,476	431	1,249
Totals	2,007	4,093	1,831	3,402
1946	604	1,115	1,228	916
1947	874	1,262	1,278	1,062
1948	E 850	E 1,375	E 1,250	E 1,000
Totals	2,328	3,752	3,756	2,978

(a) Excludes Russia and Yugoslavia.
(b) Excludes Russia and Japan.

The excess of production totals over consumption totals in 1936-1938 is due to the fact that Japanese and Russian data are not available. Both countries were large importers of copper in 1936-38, but not in 1946-48. The fact that consumption in 1946-48 was greater than production reflects the drawing down during those years of U. S. and U. K. Government stocks accumulated during the war.

LEAD

Year	Mine Production		Primary Consumption	
	In U.S.	Outside U.S. (a)	In U.S.	Outside U.S. (b)
1936	400	1,120	490	1,044
1937	470	1,234	551	1,129
1938	380	1,419	400	1,196
Totals	1,250	3,773	1,441	3,369
1946	335	850	542	711
1947	375	901	744	720
1948	E 380	E 1,000	680	700
Totals	1,090	2,751	1,966	2,131

(a) Excludes Russia and Yugoslavia.
(b) Excludes Russia and Japan.

The discrepancy between aggregate production and consumption in the 1936-1938 period in lead arises from absence of data on Japanese and Russian consumption, as both countries were importers (i. e., net consumers). In the 1946-1948 period consumption was greater than production due to drawing down of government stocks and also of stocks of raw material accumulated at smelting plants, as these figures reflect mine production and not refined metal.

ZINC

Year	Mine Production		Primary Consumption	
	In U.S.	Outside U.S. (a)	In U.S.	Outside U.S. (b)
1936	586	945	574	949
1937	659	1,055	614	1,014
1938	512	1,081	413	1,039
Totals	1,757	3,081	1,601	3,002
1946	575	986	801	678
1947	625	1,009	781	763
1948	E 610	E 1,050	E 800	E 875
Totals	1,810	3,045	2,382	2,316

(a) Excludes Russia and Japan.
(b) Excludes Russia, Yugoslavia, and Poland.

Production and consumption data are not strictly comparable since consumption excludes use of zinc in oxides, lithopone, etc. For this reason, in the 1946-1948 period it would appear that production was greater than consumption, whereas, in actuality, government stocks were drawn on by industry although not to quite the same extent as in copper and lead.

(E) Esimated.

Source: American Bureau of Metal Statistics. Wherever possible all data relating to production or consumption of secondary materials have been eliminated. Production figures are on a mine, not smelter or refinery basis.

not great enough now to warrant the additional capacity, an even longer period of time would be necessary to permit the development of more ore.

(6) It follows that if the consumers of this country continue to demand metals at anything like the present rates, we shall continue to be net importers of copper, lead and zinc in large volumes for five years or more. A statement of the prospects for the industry thus narrows down quite largely to this question of the rate of demand. If demand is maintained, then all the available and potential capacity of the domestic mining industry can be fully utilized.

Factors Contributing to Increased Demand

What has caused the present high level of demand? We should be looking at the trees and not at the woods if we were to analyze the consuming industries in detail one by one. The economy of the United States does not consist of a series of compartmented segments, each isolated from the next and dependent for its prosperity on individual factors unique to itself. A few new industries—television and aircraft are examples—are growing at a faster rate than the economy as a whole. A few others—steam locomotive manufacture and harness makers, for example—are losing ground. But basic materials such as copper, lead, and zinc are little influenced by these subsidiary trends. They move with the central stream of industrial activity. Public utilities, construction, and transportation equipment are the mainsprings of peacetime demand for nonferrous metals, and the wellbeing of these is intimately tied up with the prospects for American business as a whole.

One of the things that is bothering the United States miner is the fear that the extraordinary level of consuming demand in the last three years represents solely the satisfaction of wants pent-up during the war when civilian production was limited to the bare essentials. Once these deferred wants are satisfied, may not consumption of metals and business activity generally fall back to prewar levels?

After World War I we thought that business had moved onto a new high plateau of economic activity; that the standard of living would continue to expand indefinitely; and that there was only one direction in which volumes could go—namely, upward. The crash of 1929 brought with it a sober realization that volumes could shrink as well as expand. It would be foolish indeed to argue today that the current high rate of metal consumption is likely to be maintained indefinitely; it will not. A decline from the present level is to be expected; it is as probable as any future economic development can be.

Although there will continue to be fluctuations both upward and downward in the demand for metals, it is probably true that the average of that demand will be considerably higher in the decade that lies ahead than it was in either the twenties or the thirties. There are several factors that make this so.

First, the population of the country is increasing by more than 1 percent per annum currently and has risen by more than 10 percent since the 1936-38 period. Furthermore, the distribution of the population is changing markedly. The Pacific Coast, the Gulf Coast, and the central Atlantic States are increasing in population much more rapidly than the country as a whole. This means that in those areas new capital facilities—residences, public utilities, local transportation equipment, and shopping and service centers—must be provided on a large scale.

Secondly, the trend toward mechanization continues. This can be measured in terms of electricity production by power plants which has more than doubled between the 1936-38 period and the 1946-48 period. The more mechanized a country becomes, the higher the level of the normal replacement and repair demand for metals.

Third, the principle of stockpiling of strategic materials appears now to be widely accepted; it should exert a major influence on demand for metals for many years. Economists have long recognized that a major factor in business fluctuations has been the process of filling or emptying the pipeline of industry. The national stockpile will represent a large permanent addition to that pipeline and the filling of it will take a considerable period of time.

Consumption Likely to Stay High

So much for the long-range trend of metals demand. But are we, after three years of abnormally high consumption, standing today on the threshold of one of the inevitable intermediate dips in the curve? The man in the street can see quite plainly for himself that some industries have already slaked the feverish post-war demand and are faced with a decline in volumes—textiles, shoes, radios, the amusement industries, jewelry, and many of the electrical appliances are typical of consumers' goods which appear to be in abundant supply and in which it is not unreasonable to expect price competition to develop on a marked scale. Will metals soon be on that list?

It does not seem so. Mention has already been made of public utilities, construction, and transportation equipment as the principal consumers of nonferrous metals. In each of these industries there are still pronounced shortages. Although higher prices have tended to slow down the rate of new investment in additional utility capacity and in new plant facilities, there can be little doubt that a large core of unsatisfied demand remains. Public reluctance over the high cost of new housing may prevent

Silver King Coalition, an important source of lead in Utah

a concentrated period of extreme activity in residential construction, but as long as there is a positive shortage of dwelling units, it seems reasonable to expect several years of building at close to the 1948 rate. Higher prices do not appear as yet to have dampened the demand for new cars on the part of the motoring public and, similarly, the railroads are proceeding with plans for modernizing their rolling stock, even though the cost is high.

Price Will React with General Commodity Level

Therefore, since shortages persist in these principal markets and since, furthermore, the Government will add stockpiling demand to the requirements of private industry, consumption of copper, lead and zinc, for at least another two or three years, should continue at or close to the present high rate.

It does not follow that prices will continue to rise, or even that present prices will be maintained. Shortages of metals have been aggravated in recent months by strikes, both in Mexico and in this country, and by speculative activity in scrap. If the price structure of other commodities should turn weaker, such weakness is bound to have a sympathetic influence on the metal markets and prices may well react. However, even assuming there is some decline from present levels, prices promise to remain high in relation to the levels prevailing prior to the outbreak of the war.

The examination of the situation thus far has largely ignored the world outside the boundaries of the United States, except to make the assumption that foreign sources will make up the deficiency in domestic mine production while the present high rate of activity continues.

Foreign Situation Differs

There is rather wide acceptance of two fallacious ideas about foreign production and consumption of metals, namely:

(1) That foreign production of the nonferrous metals has greatly increased

(2) That foreign consumption of the nonferrous metals has increased in line with the increase in the United States

Actually both production and consumption of metals decreased outside the United States between the 1936-38 period and the 1946-48 period. In analyzing the foreign position one is handicapped by the incomplete nature of the statistics. One of the more annoying, but less important, aftermaths of war is the dislocation of statistical series. Data on production and consumption of Germany, Japan and other enemy countries are not complete for the period. No figures are available for Russia and only fragmentary information for the postwar period in many of the satellite countries. But since Russia and its satellites, with minor exceptions, are not participating in international trade in the nonferrous metals, it makes little difference to the markets for copper, lead, and zinc at present whether Russian production and consumption are rising or diminishing.

Foreign producers of nonferrous metals have been affected by the same problems as domestic producers and in many cases to a greater degree. Labor and fuel shortages, for instance, have probably been more of a handicap abroad than in the United States. The effect of taxation in diminishing the incentive to explore and equip new properties has been very pronounced in several important mining countries. An additional hazard for those enterprises controlled by American capital has been the general uncertainty in the exchange picture. Violent changes in the value of local currencies and regulations which prohibit or greatly restrict the ability to convert foreign currencies into dollars are serious handicaps today in connection with development of properties in Latin America. In Central Europe, Burma, and Japan local mine production has not yet recovered from the effects of the war. Given time, however, it is probable that foreign mine production will expand more rapidly than production in the United States. A number of new deposits have been developed in the last two or three years, particularly in Canada and Africa, which will contribute substantial tonnages to foreign production. Rehabilitation of mines in Germany, Italy, and Japan is also likely to increase the output of those countries.

European Postwar Metal Use Down

The decline in consumption of metals outside the United States is by no means uniform. Canada, Australia, and Latin America are all using copper, lead, and zinc on a substantially larger scale than prewar. If these areas are excluded from the computations of consumption, it would be seen that the decline in European consumption has been quite precipitous. Three factors contribute to European reduced use of metals:

(1) During the 1936-38 period there was a large use of metals for armaments. Outside of Russia, for which figures are not included in the compilations, the armaments demand is much smaller than it was ten years ago.

(2) The financial situation of the principal consuming countries makes it difficult for them to buy raw materials for which they must make payment in foreign exchange. This, of course applies in great measure to copper, lead, and zinc. The ECA makes funds available currently to meet this situation, but only after "screening" which limits purchasing to smaller totals than would be the case were dollars freely available.

(3) Consuming industries in Germany and Japan are under the restrictions of the Occupation Authorities, and the fabricating industries of other countries do not have the capacity to take up the slack.

The loans which the United States made to Great Britain, France, and other European countries in 1946 and 1947 and the Marshall Plan have supplied the principal European consuming countries with some dollars to buy metals. Without this aid a much more precipitate drop in foreign consumption would have occurred. There has been an impression that the Marshall Plan would mean a substantial increase in European consumption of metals; thus far it has not worked that way. The total tonnage of metals going to Europe in 1948 from the Western Hemisphere countries was somewhat less than in 1947.

European metal consumers appear to be quite skeptical of the present high prices. The fact that his Government is getting the dollars to pay for metal imports as a grant from the United States does not in any way affect the individual metal consumer. In the past he has purchased dollars with Francs, or Pounds Sterling, or Lire, or whatever his local currency may be; he still must do so under the Marshall Plan, and he is very conscious of the fact that the amount of local currency which he must put up has greatly increased. In this sense, European consumers today appear to be more price conscious than consumers in the United States.

Over the longer term, however, a gradual revival in European consumption of metals is probable, assuming that war or its equivalent is avoided. Past experience has shown that European metal consumption neither increases nor decreases as rapidly as consumption in the United States. While the per capita use of metal in Europe is far less than in this country, nevertheless, the trend of consumption over any protracted period is likely to be in the same direction. Therefore, the sharp increase in the use of metals in the United States probably will be paralleled in Europe if exchange and political difficulties can be overcome.

In fact, by the time shortages in the United States are at an end, European requirements should be increasing, thereby absorbing tonnages of foreign metals which at present are being imported into this country.

Regular meetings are an important element of safety programs

Safety in Coal, Metal, and Nonmetallic Mineral Mines

Record Low Accident Rate Attained in 1948—Roof and Coal Falls Continue to Cause Most Accidents

By D. HARRINGTON
Arlington, Va.

SEVERE CRITICISM has long been directed at the mining industry of the United States because of its high rate of accident occurrence, as compared with other domestic industries and with the mining industries of other countries, particularly Europe. Statistics, often not of a strictly comparable nature, indicate that the accident frequency rate in all mining is currently about three times and the accident-severity rate is about seven times as great as the average for general industrial work in the United States. These figures are by no means comforting to humanitarian mining men, irrespective of their status in the industry, and they constitute a challenge that certainly cannot continue to be ignored.

When the above statistics are augmented with data indicating that, on an exposure basis, our mines (more particularly our coal mines) have accident rates two, three, or even more times as great as more or less similar types of mines in Europe, particularly England, Wales, Belgium, France, and Germany, the picture becomes much darker. The sting is alleviated to some extent by the knowledge that our coal mines produce about four to five times as much coal per man per day as is produced in at least some European mines. However, foreign accident statistics should be carefully analyzed before being much concerned about them, because almost invariably they are not strictly comparable owing to several considerations, not the least of which is the fact that foreign methods of compiling or recording accident statistics often differ materially from ours. Foreign mining and many other conditions are definitely dissimilar to ours.

Unquestionably, it should also be taken into consideration that the accident rate of the 140,000,000 or more constituting the populace of the United States is, as a whole, much higher than that of any other major country in the world. It is two, three, or more times the rate of the European countries that have more favorable mine-accident rates than those of the United States. Moreover, it is significant that the mine-accident-severity rate of British mines is about six times the average accident-severity rate of the major industries of the British Isles, or but little more favorable than the comparable figures in the United States. Mining has an accident-severity rate about seven times that of the average of about 30 of the major industries of this country.

Loose use and equally loose interpretation of accident statistics of foreign countries as compared with ours (frequently not even reasonably comparable), have fostered the fairly prevalent belief that the mines of the United States are conducted with less regard to safety than in other coun-

tries. But there is good reason to believe that the workers' safety is given at least as much consideration in our mines as in the mines of any other nation.

Mining Fatality Rate Lowered Faster Than General Average

Mining is inherently more hazardous than the great majority of major occupations since the workers generally are employed underground and are subject to such risks as falls of ground, the use of explosives, relatively poor lighting, handling moving machinery and electric current in cramped places, transportation difficulties analogous to those on streets and highways, and often inadequate ventilation with explosive or toxic gases and dusts present. The natural result is that mine accidents are proportionately more frequent and generally more severe than in other industries.

That the coal mining industry has progressed in preventing accidents is evident from the reduced fatal accident rate. In 1911 the fatality rate of the United States per 100,000 population was 84.7 and in 1946 the present estimate places the rate as 70.8, the 1946 rate being 16.4 percent lower than the 1911 rate. The coal mine fatality rate in 1911 was 365 per 100,000 employed, and the estimated rate for 1946 is 213, or a reduction of 41.6 percent below the 1911 rate. Hence, coal mining has reduced its fatality rate 2.7 times as much or as rapidly as has the entire country.

On the basis of each million tons produced the coal mine fatality rate is 69.3 percent lower in 1946 than in 1911, the rate in 1911 being 5.35 fatalities per million tons, and in 1946 it was 1.64.

Notwithstanding several decades of progress, accident statistics show conclusively that the mining industry continues to be one of the most hazardous of all major occupations of this country. In the above tabulation, National Safety Council Accident statistics reveal the relative standing of mining with other major industries in the United States in 1945.

For statistical purposes, the mining industry may be divided into three major categories, namely: coal mining, metal and nonmetallic mining, and quarrying. Many of the same types of risks are involved in all of these, also each has its own hazards. The National Safety Council published the following accident statistics for the year 1945:

Type of mining	Accident data			
	Frequency	Rank	Severity	Rank
Quarrying	9.83	10	1.33	23
Mining other than coal	25.83	34	5.58	39
Coal mining	63.06	39	11.94	40
All major industries (average)	13.63	—	1.16	—

As a whole the accident statistics of the mining industry compare unfavorably with similar statistics of other industries. Yet scores of remarkable accident-free records have been established by mines that compare favorably with the records of industries far less hazardous than mining.

Safe Coal Mining

One underground mine with over 400 persons employed operated for 13 months without a lost-time accident and produced over 800,000 tons of coal in nearly 1,200,000 man-hours. One small coal mine operated 31 months without a lost-time accident to its approximately 40 employes who produced about 250,000 tons in approximately 270,000 man-hours. One large mine with over 500 employes worked eight months in low coal without a lost-time accident and produced approximately 400,000 tons of coal.

Metal Mine Safety Records

Underground metal mines have done notably well in long-time, high-exposure operation without a lost-time accident. One underground iron ore mine operated for a full year without a lost-time accident to its approximately 300 men and produced about 780,000 tons in about 830,000 man-hours. A small mine (fewer than 50 employes) worked nearly five years without a lost-time accident in approximately 500,000 man-hours.

One open-pit property with about 45 employes worked over 17 years without a lost-time accident and produced nearly 5,400,000 tons in approximately 2,300,000 man-hours. Another property produced about 20,000,000 tons without a lost-time accident to about 275 employes in two years and seven months. Numerous properties with 25 to 50 employes operated 5 to 12 years without a lost-time accident and produced several hundred thousand tons, with man-hours around or over 500,000.

Low Accident Rate in Quarries

Cement plant quarries have established exceptionally fine safety records. One plant operated over 12¾ years without a lost-time accident in about 3,580,000 man-hours, with production of almost 7,260,000 bbl of cement. One cement plant operated for 16¼ years without a lost-time accident in about 1,325,000 man-hours, and several cement plants have over 2,000,000 man-hours of work without a lost-time accident.

Non-fatality records of long-time operation, high figures of exposure, and heavy production in all kinds of mines and mining plants, coal and non-coal, underground and surface, are available by the hundred. One coal stripping operation handled over 90,000,000 tons of material without a fatality, and an open-pit copper producer moved upwards of 11,000,000 tons of ore and waste without a fatality. Several open-pit iron ore mines have worked more than 20 years without a fatality with several million tons of ore produced and man-hours of exposure in excess of 10,000,000, one having nearly 47,000,000 man-hours.

Some underground coal mines have produced more than 5,000,000 tons without a fatality, one such mine pro-

DEATHS AND DEATH RATES OF WORKERS BY MAJOR INDUSTRIES, 1945

Industry	Total deaths (In round numbers)	Deaths per 100,000 workers
Mining, quarrying, oil and gas wells	1500	187
Construction	1700	126
Transportation	2100	68
Agriculture	4500	53
Public Utilities	400	44
Service	2300	20
Manufacturing	2700	19
Trade	800	10

ducing about 7,800,000 with nearly 10,500,000 man-hours of work. One fairly large mine operated 21¼ years without a fatality, producing about 4,100,000 tons in approximately 8,100,000 man-hours; another operated 18¾ years without a fatality in production of nearly 3,600,000 tons of coal in a gassy, pitching coal bed.

Reducing Accident Rate

Notwithstanding the hue and cry raised against the alleged lack of safety in mining, the industry has made substantial progress in reducing accidents and accident rates. The number of fatalities in the coal mines of the United States was reduced from 2656 in 1911 to about 975 in 1946; the fatality rate from 365 per 100,000 mine workers in 1911 to approximately 213 in 1946; and from 5.35 per million tons of coal in 1911 to approximately 1.64 in 1947. Hence during the 35 years the annual number of fatalities has dropped from 2656 (in 1911) to 975 (in 1946), or 1681, or about 63½ percent. The fatality rate per 100,000 workers has fallen 41.6 percent and the fatality rate per million tons of coal has dropped 69.3 percent.

Non-coal mines also have a notable record in decreasing fatal accidents. In 1911 there were 695 fatalities and in 1945 about 112; the fatality rate per thousand 300-day workers was 4.45 in 1911 in the non-coal mines and about 1.62 in 1945. This gives a reduction of 583 fatalities per year and a decrease of 63.6 percent in the fatality rate per thousand 300-day workers. Unquestionably mines have done a good job in trying to improve safety conditions. But the ultimate in safety in mining has not been reached.

Fewer Fatalities in 1948

Only estimates can be given on mine accident statistics (coal and non-coal) for 1948, but there is reason to believe that the number of fatal accidents will be about 1225, or considerably fewer than the approximately 1370 of 1947. Non-fatals in 1948 appear to be around 69,000 as against about 73,000 in 1947.

In metal mining there were about 125 fatal and slightly over 8000 non-fatals, these figures being essentially the same as in 1947. In non-metal mines and quarries there were about 85 fatal and 6500 non-fatal accidents in 1948 as compared with 80 fatals and 6200 non-fatals in 1947. The rates in both fatal and non-fatal accidents in non-coal mines in 1948 will be essentially the same as in 1947.

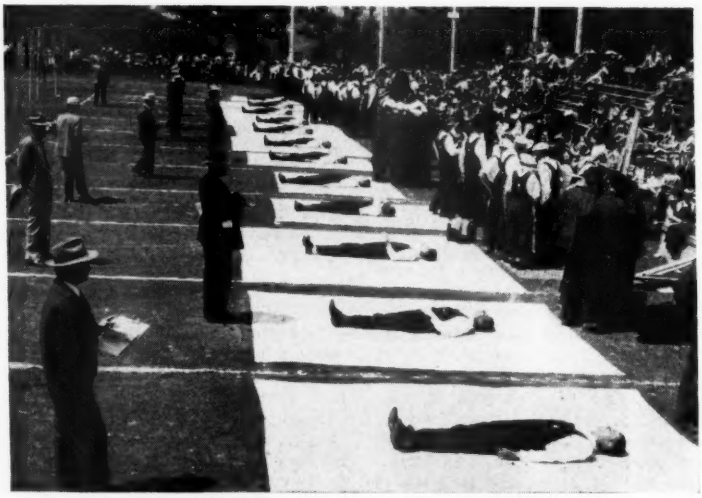
In coal mining the number of fatalities in 1948 is now estimated at about 1015 in comparison to the 1165 of 1947 and the approximate 975 of 1946. The fatality rate of about 1.56 per million tons of coal produced is the lowest in the recorded history of the coal mining industry of the United States, the rate being 1.69 in 1947 and 1.64 in 1946, the 1946 rate being the previous low. Non-fatals in 1948 in coal mining will aggregate about 54,000, or somewhat fewer than the approximate 58,000 of 1947.

Bituminous coal mining had about 876 fatalities in 1948 against 940 in 1947, the difference of 120 being due chiefly to the fact that explosions of gas and dust caused about 130 fewer fatalities in 1948 than in 1947. The fatality rate of about 1.46 per million tons of bituminous coal produced in 1948 is lower than the rate of 1.57 in 1947, the lower rate in 1948 being due chiefly to the avoidance of severe gas and coal dust explosions in 1948.

Anthracite coal mining *"did itself proud"* in 1948 with a reduction in the fatality rate per million tons to 2.54 in 1948 from the 3.06 of 1947; here again the main feature in the reduction was the avoidance of fatalities from severe gas explosions in 1948 as compared with 1947. Fatalities in anthracite mines numbered about 145 in 1948 as compared with about 175 in 1947; non-fatals in 1948 as well as in 1947 numbered about 12,500.

Roof and Coal Falls Cause Most Accidents

Bituminous and anthracite mining undoubtedly established the lowest fatality rates in 1948 in the history of both types of mining. The main reasons for the lowered rates were the heavy reduction of fatalities in haulage and in gas and dust explosions in 1948 as against 1947 in both bituminous and anthracite mines.



First aid contests encourage miners to practice safety

Specially-built, man-trip cars provide miners with safe transportation

Rather oddly, the reduction in total fatality rates in both types of coal mining was accomplished notwithstanding an increase in 1948 in the fatality rate from falls of roof and coal in both anthracite and bituminous properties, falls of roof and coal being by far the most prolific cause of accidents in our coal mines year in and year out.

Six major disasters (single accidents which resulted in five or more deaths) with 49 fatalities in 1948, all of them in bituminous coal mining. There were three explosions of gas or dust with 32 deaths, two were caused by falls of roof or coal with 12 deaths and one fire with five deaths. The six major disasters occurred in six different states, none in such large producing states as Pennsylvania, Ohio, Illinois and Kentucky and none in the Rocky Mountain or Pacific Coast states. Two of the major disasters due to explosions of gas or dust were supposed to have been ignited by electricity, though either or both might have been caused by illicit smoking; one was ascribed to ignition by a defective flame safety lamp, though this one also might have been caused by smoking. The occurrence of two major disasters due to falls of roof or coal calls attention to the fact that this type of multiple accident can be expected more and more as mines become highly mechanized with accumulation of workers at points around loading and similar types of machinery, especially at or near working faces.

Education for Safety

During 1948 educational efforts towards the forwarding of safety in the mineral industries were greatly augmented and it now appears that "at long last" those who are or should be interested in the safeguarding of our mines and those who work in them have accepted the idea that *education, not compulsion, is the key to bringing mine accidents to a reasonable minimum.* Among these new efforts are the establishment of actually functioning accident prevention organizations on a nation-wide basis in the coal industry, both management and workers. Major emphasis is being given to the education of those engaged in the industry as to what actually constitutes really safe procedures in the mining of coal. In this effort the coal mine inspection work of the U.S. Bureau of Mines has been expanded (also at long last) to allow of expending at least a portion of its efforts along educational lines instead of the previous routine inspection chiefly along fault-finding or snooping lines.

During the year the U.S. Bureau of Mines put into effect a new type of meritorious award to give suitable recognition to those who save life or limb by skillful use of first-aid procedure. Several awards were made through the Health and Safety Division to persons who had been trained in first aid by the Bureau and by whose application of first aid methods life or limb had been saved. This new type of award fills a long-felt want. Previously awards for successful application of first aid were made by the J. A. Holmes Safety Association but usually the award was made only when the recipient has risked his own life (or lost it) while performing the first aid service. The new award should help much to encourage first-aid training by the Bureau of Mines teachers. Well-given, first-aid training is one of the most efficient features in educational work aiming at the promotion of safety in the mineral industries.

Research Promotes Safety

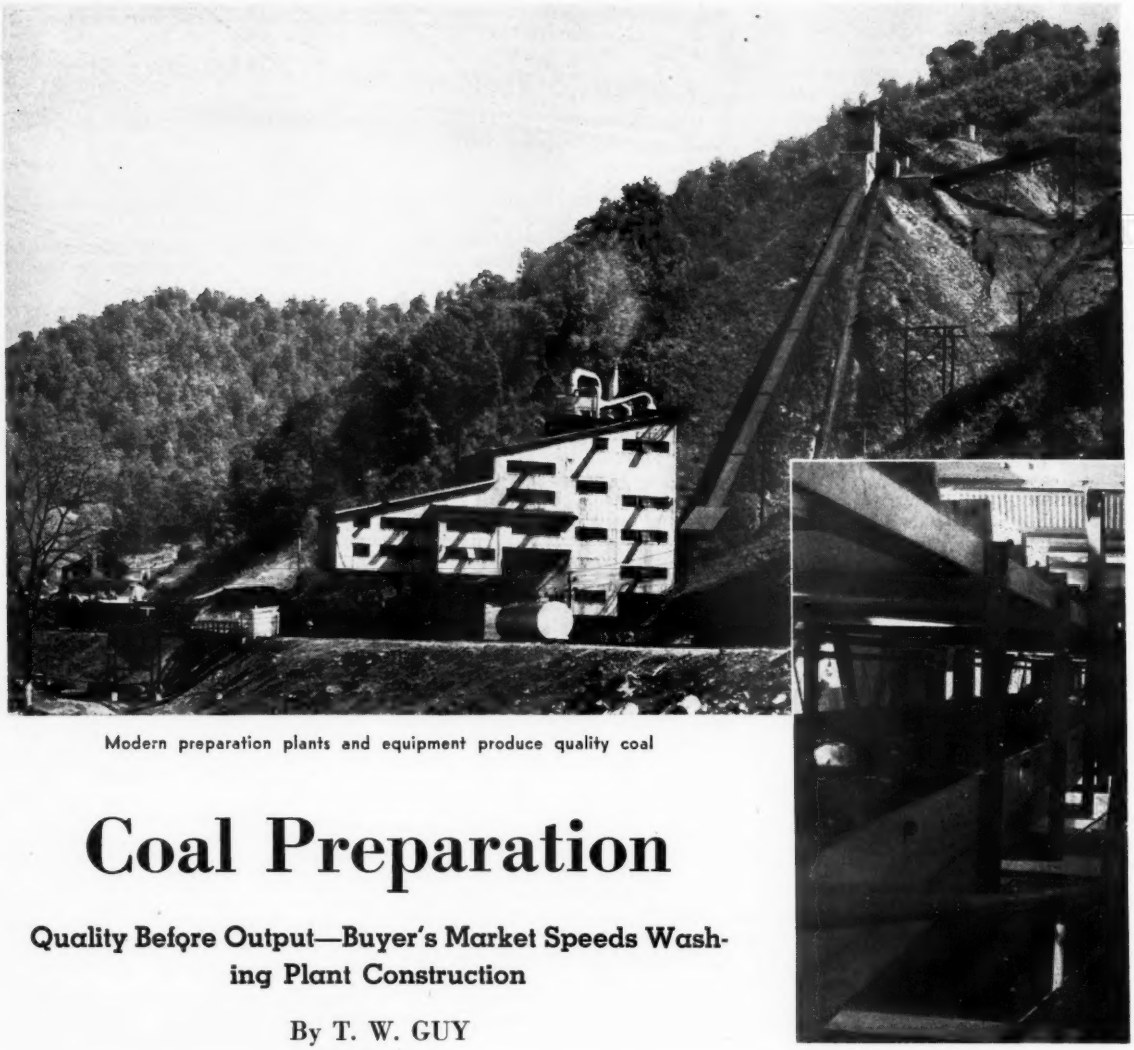
Much research is being done in connection with nearly all phases of mining and the results will when finally applied to mining have definite effect on safety. It is announced that machines for continuous mining of coal will bring the output per man per day to several times the present figures; in both coal and metal mining, stripping procedures are being perfected by which mining can be done to a depth of several hundred feet. Numerous other types of research are underway and essentially all of them will be of aid in reducing the life and limb toll in mining.

Accident Down Trend Anticipated

In 1948 all mines, pits, and quarries of the mineral industries of the United States caused about 1225 fatalities, a far better record than that of the year 1911 when they caused 3351 fatalities and produced a much lesser tonnage than in 1948. The 1948 record holds to the downward trend which started about 1910. The safety movement in mining is "no flash in the pan" but has its roots so well intrenched that the downward process can be expected to continue in the future provided industry continues to realize its obligations and to act to protect its own best interests.

Any program for the mineral industries, whether long-range or year to year, which omits full consideration of matters pertaining to health and safety is inherently defective and, in at least some important phases, is foredoomed to failure. The trend of the past three decades toward the amelioration of working conditions in all phases of the nation's industrial activities has greatly accentuated the importance of welfare work both from the humanitarian viewpoint and from the financial side. Slowly but surely the trend has been toward the handicapping of unsafe or unhealthy industrial plants by higher and still higher penalties for occurrence of accidents or ill health to employes. There is good reason for the belief that, in the not far distant future, unsafe or unhealthful industrial plants will be unable to operate. In general the larger more responsible mining organizations are now doing a fairly "good job" in trying to safeguard their employes as well as their properties. However, even in this day, far too many of our mining people still look upon those who advocate up-to-date safety and health procedures as faddists or dreamers. It would be well for the responsible leaders of the industry to take what measures may be available to educate these Rip Van Winkles and thereby prevent the vote-hungry politicians from taking hold and trying to cram safety down the throat of the industry by ill-conceived laws and regulations usually formulated by individuals or by groups of people with axes to grind.

Safety in loading and firing is a vital factor in reducing accidents



Modern preparation plants and equipment produce quality coal

Coal Preparation

Quality Before Output—Buyer's Market Speeds Washing Plant Construction

By T. W. GUY

Consulting Engineer
Charleston, W. Va.

DURING THE late summer and early fall of 1948 when the demand for coal fell below productive capacity for the first time in a number of years, it came as a distinct shock to many producers and their sales organizations. Rapidly consumers, who for a number of years had frequently been glad to take almost any coal they could get in the market, began to assert themselves in no uncertain terms in their demand for lower ash, sulphur, moisture, higher F.S.I., better sizing, etc. Since July the difficulties of meeting market requirements have increased progressively. As a result, great pressure has been brought to bear for the completion of preparation plants under contract and under construction, also to improve results in all operating preparation plants. An increased demand for new preparation facilities has been piled upon an industry already contracted in most cases to full capacity for one or more years ahead. Many producers are now anxious to find a quick way to meet the more difficult market specifications.

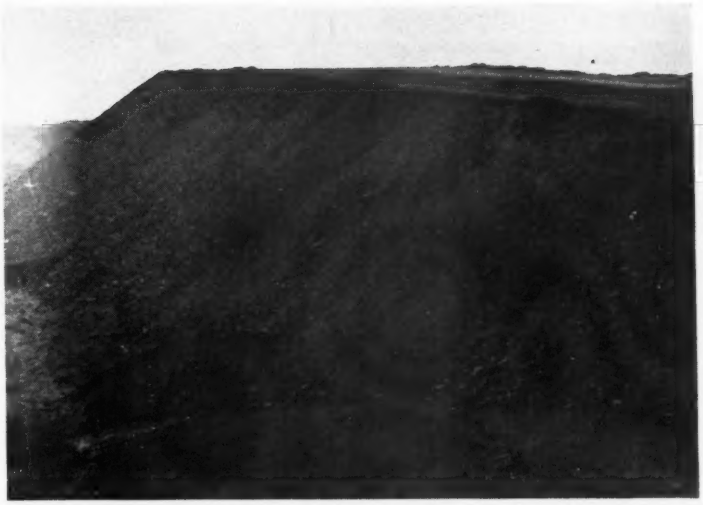
In recent years the time required between signing the contract and beginning the operation of medium and larger preparation plants has usually ranged from one to two or more years. There has been a distinct trend toward standardization versus the usual tailor-made preparation plant at least for medium to small plants. In some cases, three or more adequate plants have been built for different customers from the same plans and specifications. This trend will doubtless continue as long as there is a shortage of engineers, equipment, and building materials. During the last half of the year, contracts were being let for the delivery and construction within a few months of heavy media and other washers having standard arrangements of washers and auxiliaries. These washers are expected to enable their purchasers to meet the present difficult market requirements.

With comparatively few exceptions, the coal producers deserve credit for making sincere and often expensive efforts to maintain the quality of their products and their preparation standards during the long seller's market which preceded the recent return of the coal market to its normal condition in which the available supply is greater than the demand. It is believed that the majority of the experienced and responsible producers made a good record considering the difficulties of labor, supervision, and supply conditions during this period.

Fine Coal Preparation—A Growing Problem

With the development and introduction of continuous loading machines now well started, the problems of preparing the ⅜-in. and smaller sizes for market will continue to be of increasing importance. In most fields the percentages of these sizes has been increasing constantly since the beginning of mechanical loading, and there will, no doubt, be even greater increases with the continuous loaders.

During the year a number of large and small plants have gone into operation, or are under construction, using jigs, concentrating tables, classifiers, launders, froth flotation, spiral separators, or other units for cleaning the fine sizes. Progress has been reported in the development of both the mechanical and the technical features of washers, wet and dry concentrating tables, mechanical and heat dryers, filters, flotation units, thickeners, and other devices required for fine coal preparation, but there is still a long way to go. There is urgent need for more research to aid development of more efficient and economical equipment and methods for cleaning, recovery, and drying the minus ⅜-in. sizes of coal, also for the prevention of stream pollution, and waste of water, and for prevention of fires in refuse banks. In most fields these problems are becoming more important with each passing year. The competitive position of the individual mine in relation to other mines in its field, and also the ability of the coal industry to compete with other sources of fuel must depend to an increasing extent on the successful and economical preparation and marketing of the fine sizes of coal.



Reject handling and disposal is becoming a major problem

Hand Picking and Refuse Disposal Trends

With mechanical loading and increasing wage rates, the trend has continued strongly toward maximum mechanization of the cleaning of large sizes of coal and in the disposal of the large refuse or rocks. In some cases the large rocks are scalped off before the coal enters the cleaning plant. The details vary according to conditions and circumstances, but the idea is to dispose of such material at the least cost and with minimum wear and tear on the plant and refuse handling equipment. In some plants the large rocks go into a specially-constructed bin from which they are hauled away by truck or larry without crushing. In other plants the large rock is crushed with the large coal and all goes through the preparation plant.

In an investigation of a number of plants, it will be found that the percentage of large rock varies widely in the coal from different seams, and from different mines in the same seam, and also that the cost of separation and handling large rock in the plants varies to a surprising extent, both as to the cost of equipment required, and as to cost per ton of such rock handled, or per ton of large coal. In an increasing number of plants, hand-picking is being eliminated entirely, by either crushing the large coal and refuse to a size which can be handled in the washers, or by rock scalping, or by some combination of the two.

The importance of preventing fires in refuse or gob piles has increased materially during the past two or three years. A subcommittee of the AMC Committee on Surface Preparation, Henry F. Hebley, chairman, is making a study of possible methods for preventing and for extinguishing such fires.

Every day, 4600 tons move over this conveyor at the Maiden Mine, Maidsville, W. Va.

Looking down on the "A" level of the U. S. Vanadium Corp.'s Mine near Rifle, Colo.

Atomic Energy Minerals

Private Enterprise Urged to Discover and Produce Critical Uranium Ores

By the Staff of the Exploration Branch
Raw Materials Operations
Atomic Energy Commission

WE ARE today living in the Atomic Age. Even though the most visionary cannot appraise its immense possibilities, all agree that peacetime uses of atomic energy ultimately may affect world history more profoundly than any other scientific development in the past century.

Already "isotopes," by-products of atomic development, are being used in medicine and surgery; experiments are being made with "tracers" to improve soil and crop yields; similarly, in ore beneficiation studies, metallurgical research, and medical research, isotopes are opening new horizons to scientists and engineers. Some industrial power from the atom has been predicted within ten years. But all these beneficial peacetime uses as well as the national security aspects of atomic energy are dependent upon the mining profession for more and more uranium.

Whether for the atomic bomb or for peacetime uses, atomic energy begins with raw materials. But in the case of atomic energy, there is only one raw material known today—uranium.

Uranium is the only element which has a naturally occuring fissionable form—that is, a form that can be split to release the enormous energy locked within the atom. This fissionable form of uranium is called U-235. It occurs in natural uranium in the ratio of one part to 139 parts of non-fissionable uranium (U-238).

Since 1000 pounds of metallic uranium will yield only about seven pounds of U-235, the available supply of naturally occurring fissionable material in the world is limited. However, through research, it has been learned that a new element named plutonium, not found in nature and which is fissionable, can be made from U-238 in an atomic pile.

Since, through the plutonium making process, it is theoretically possible to use all natural uranium, the quantity of fissionable material in the world is limited only by the available uranium ores. The role of the mining profession and industry, therefore, in the successful development of atomic energy is apparent.

Although uranium is widely distributed in the earth's crust (which contains about as much uranium as it does copper), it is seldom found in high grade concentrations of commercial value. However, there is no reason to believe that uranium will not move through the same cycle as other metals and be recovered from progressively lower grade ores not now sources of uranium.

Infant Industry Will Expand

The uranium mining and beneficiation industry may be thought of as being at a stage of development equivalent to that of the common metals industry in the beginning of the nineteenth century. Because of the great importance of atomic energy and its dependence upon uranium it is the Commission's hope that the development of the uranium industry will be much more rapid than in the case of other metals, stimulated as it will be by government effort and intense interest and cooperation by the mining industry, without which truly great progress may not be achieved.

It is the Commission's intention to make industry aware of the possibilities and advantages of such cooperation and participation.

Approximately 115 minerals are known to contain uranium. Some of these contain as much as 90 percent U_3O_8 (uranium oxide), and others carry but trace amounts.

At present, only three groups of minerals are commercially valuable as sources of uranium. These are:

Pitchblende and uraninite (simple oxides)

Autunite and Torbernite (phosphates)

Carnotite and tyuyamunite (vanadates)

There are five major classes of uranium deposits which are now being exploited or may be exploited in the future:

(1) High grade hydrothermal pitchblende-radium deposits

(2) Carnotite-type and roscoelite-type, vanadium-uranium ores of the Colorado Plateau

(3) Gold-uranium ores of South Africa

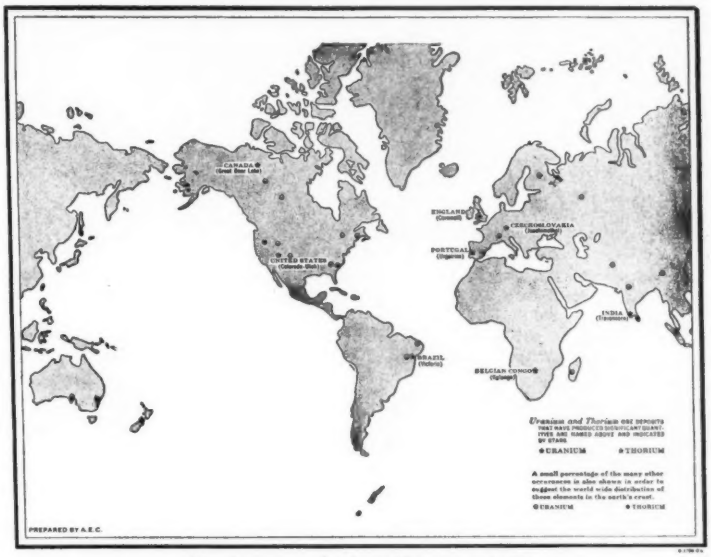
(4) Uranium-bearing oil shales, phosphates, and other marine sediments

(5) Pegmatites, placers, and other deposits of minor importance

The high grade, hydrothermal, pitchblende-radium deposits and the Colorado Plateau carnotites have been the chief sources of uranium and radium in the past. The three most important of the former being Joachimsthal and other deposits of the Erzgebirge of Czechoslovakia and Saxony, the Shinkolowbwe Mine in Belgian Congo and the Eldorado Mine, Great Bear Lake, Northwest Territories, Canada.

When the heavy black primary minerals such as uraninite and pitchblende are broken down by weathering processes, they form secondary minerals.

Most of these secondary (supergene) minerals are widely scattered and of various compositions, such as phosphates, carbonates, arsenates, sulphates, silicates, vanadates, and uranates of uranium. Often brightly colored in yellows, reds, or greens, they are usually identified as "bright oxides." Although Portugal has produced a small amount of radium from the bright oxides, carnotite, found primarily in the United States, is the most important commercial mineral of the bright oxide type. It occurs as impregnations in sandstone and occasionally in highly concentrated replacements of logs and other carbonaceous material in the Morrison formation of the Colorado Plateau Area.



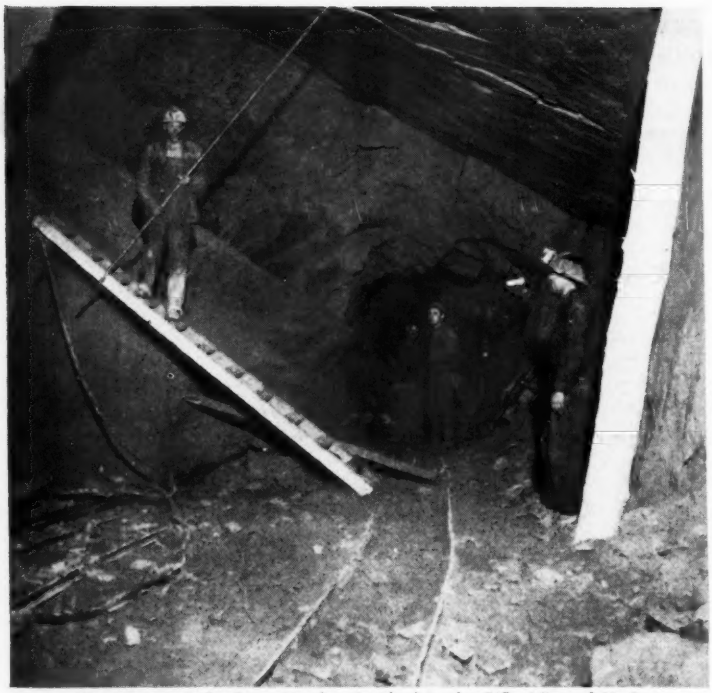
Atomic energy begins with raw materials

Uranium has enjoyed three periods of importance since its discovery prior to the atomic era. Toward the end of the eighteenth century, the old silver camp at Joachimsthal was reactivated to produce uranium minerals for coloring ceramics and glassware. Green, orange, brown, black, and yellow uranium compounds for coloring purposes were produced from the Joachimsthal deposits, which were mined as a state-owned enterprise.

With the discovery of radium in 1898 by the Curies, increased interest in uranium brought production of pitchblende and secondary minerals in Saxony, Cornwall, and, a little later, in the United States.

Carnotite was mined in the United States for its radium content early in the 1900's. After World War I, the third era of interest in uranium bearing ores began, due to their

Uranium recovery is principal purpose of the Monticello, Utah, plant. Built by the Vanadium Corporation of America as a vanadium reduction plant, it is now owned by the AEC



Note steep pitch of uranium bearing bed in the Rifle Mine of U. S. Vanadium Corp.

vanadium content, although radium and uranium were recovered when commercially feasible.

With the advent of the Atomic Age the strategic importance of uranium and uranium minerals was magnified a thousand-fold. During the war, the principal sources of uranium for the atomic bomb project were Congo and Canadian ores (pitchblende) and domestic carnotite, mainly from mill tailing and dump piles of vanadium mines, and to a lesser extent, from new workings in the Colorado Plateau. The United States was (and still is) largely dependent upon foreign sources for the vital uranium ores.

Atomic Energy Program Based on Mining Industry

If the United States is to retain its lead in the utilization of atomic energy, additional sources of uranium must be found; this can only be done with help from the mining industry and it is to this group that the Atomic Energy Commission looks for cooperation and assistance. The Commission is already purchasing the uranium by-product from the operations of the vanadium industry.

Although production figures on uranium cannot be published in this article, the mining industry need not be concerned with production and consumption trends. The Commission has guaranteed a minimum price for a definite period, has officially stated the great importance of new sources of uranium, and where significent production can be obtained from low grade ores, as in the case of the Colorado Plateau, special arrangements may be considered.

Production Stimuli

A three point program to stimulate the discovery and production of domestic ores by private competitive enterprise was initiated on April 11, 1948.

Under this program, the Government:

(1) Guaranteed ten-year prices of $3.50 per pound of contained U_3O_8 for small lots of domestic refined uranium, and of $3.50 per pound of recoverable U_3O_8 less refining costs for small lots of ore or mechanical concentrates assaying at least 10 percent U_3O_8, both prices fob shipping point.

(2) Offered a bonus of $10,000 for the discovery of a new deposit and production therefrom of the first 20 tons of uranium ore or mechanically produced concentrates assaying 20 percent or more U_3O_8.

(3) Guaranteed three-year minimum prices for the low grade carnotite and roscoelite-type, uranium-vanadium ores of the Colorado Plateau area, and initiated plans for operation of two vanadium-uranium plants in that area.

Ore is already being purchased by the Commission at Monticello, Utah, and by the vanadium companies at Naturita and Durango, Colo. Plans are under way for the operation of the Uravan and Durango, Colo., plants and it is anticipated that these plants will soon be purchasing ore.

Payment for Ores Produced

The Commission's guaranteed minimum prices have been made applicable to ores discovered on and produced from public lands, even though the Atomic Energy Act technically reserves these ores to the Government, in accordance with the Commission's authority under the Act to pay fair and reasonable sums, including profits, for the discovery, development, and mining of such ores.

U. S. Geological Survey crews diamond drill in Colorado under AEC Program

Also, the Commission has been notified by the Department of the Interior, which administers the disposition of public lands, that in accordance with its interpretation of the spirit of the Atomic Energy Act valid locations may be staked on public lands for uranium alone or in conjunction with deposits of other valuable ores. Thus, the discoverer of minable uranium deposits on public land can expect to receive a proper reward for his efforts.

Price schedules under the three-year minimum guarantee are as follows for ore assaying 0.2 percent U_3O_8 or better (the AEC will also purchase ores containing down to 0.1 percent U_3O_8): a price of $0.31 per pound of V_2O_5 up to ten lb of V_2O_5 for each pound of U_3O_8; a basic price of $1.50 per pound of U_3O_8; a development allowance of $0.50 per pound of U_3O_8; a further allowance of $0.50 per pound of U_3O_8; a premium of $0.25 per pound for each pound of U_3O_8 in excess of four lb per short ton and an additional premium of $0.25 for each pound in excess of ten lb; and a haulage allowance of $0.06 per ton-mile up to 100 miles.

Under these schedules, an ore containing 2 percent V_2O_5 and 0.2 percent U_3O_8 produced 50 miles distant from a purchase deposit would be paid for on delivery at the rate of $25.40 per ton.

High grade uranium ores are often associated with silver and base metals such as copper and cobalt. The U.S. Atomic Energy Commission will pay for these or other valuable materials contained in uranium ore it purchases. This should be of interest to prospectors and small mine operators as well as large mining companies. Furthermore, larger mining companies may find that tailings and smelter products previously discarded contain recoverable uranium which can be sold to the Commission. The possible importance of supposed valueless products has much precedence in the case of other metals. The Commission has arranged with the U.S. Geological Survey to conduct investigations of mines, mills, and smelters for such possibilities.

The U.S. Atomic Energy Commission will also purchase imported uranium ores.

In order to obtain the advice of expert mining men on its overall raw minerals program, the Commission has appointed an Advisory Committee on Raw Materials composed of ten well-known geologists and engineers.

Active Research on Low Grade Ores

The Commission is engaged in a comprehensive program of ore beneficiation research and experimentation in cooperation with universities, research institutions, and private industry designed to determine the feasibility of uranium recovery and to bring into production presently unused low grade sources such as shales, phosphates, low grade, and refractory uranium bearing vanadium ores, etc.

A comprehensive diamond drilling program is under way on the Colorado Plateau and in other areas to ascertain where new deposits of uranium ores may be and what the total ore reserves are. The exploration is conducted by the U.S. Geological Survey and the U.S. Atomic Energy Commission.

The Commission has established laboratories with trained and skilled technicians to examine, identify, and analyze mineral specimens for radioactivity and uranium content. Private laboratories and assayers are rapidly developing techniques for accurate analysis and it is hoped that they will soon be able to perform the same services in regard to uranium ore as they have for other commercial ores. The Commission is planning to make available to these firms information it has developed in its laboratories on the assaying of uranium and thorium.

The Commission has arranged for the publication of a "Prospectors' Guide for Uranium Minerals," to be issued in the near future. Also the Commission has planned exhibits and lectures before mining societies.

Ore Search Techniques

In the past, few geologists, mining engineers, or prospectors paid much attention to uranium ore occurrences and many are not familiar with the techniques required to appraise them.

Essentially, prospecting for uranium is no different from ordinary prospecting activities. However, because of the radioactivity of the uranium minerals, additional techniques are available to help the prospector in his search. By testing mineral specimens or rock in place with a Geiger Counter, the relative amounts of radioactive substances in the mineral can be indicated. With the proper precautions, this testing can give a fair idea of the value of the rock, but definite quantitative determination can be made only in an analytical laboratory.

Mineralogical study and identification is helpful in determining whether the radioactivity is due to uranium, thorium, or some other radioactive element. Practically all rocks show weak radioactivity. Igneous rocks, notably granites, are most active and only pure limestones and pure quartz sands are nearly inactive.

The heavier radioactive elements have been grouped into three series: The uranium-radium series, the thorium series, and the actinium series.

Each series is composed of many radioactive elements. The above are referred to as the "heavy elements."

The Uravan mill, Montrose County, Colo., treats uranium bearing ores

However, among the "light elements," there are three which are known to be naturally radioactive, namely, potassium, rubidium, and samarium. The first two (light elements) are alkali metals, and the third is a rare element found in association with the rare earths.

Therefore, when ore and minerals are tested with the Geiger-Mueller Counter, a positive result does not necessarily mean that the materials contain uranium. The radioactivity may be due to thorium, radium, mesothorium, a disintegration product of thorium, which closely resembles radium, or to the radioactive isotopes of potassium in the potash feldspar (orthoclase) of granite.

The prospector may use other indications of uranium minerals than radioactivity. For example, the color around a uranium-thorium mineral in a pink or red feldspar dike is usually a conspicuously darker brick-red shade. In white dikes such minerals may cause a brown or black discoloration in the surrounding rock. Dark or "smoky" quartz and dark purple fluorite, which are often found in pegmatites and veins of igneous origin may owe their color to radiation. Such discolorations may therefore indicate the presence of uranium or radioactive minerals. Another tool useful to the prospector is the ultra-violet lamp since some secondary uranium minerals fluoresce when subjected to rays of ultraviolet light, although primary uranium minerals do not. However, this is not a final test for uranium, because other minerals also fluoresce.

The 1948 United States search (both government and private) and demand for uranium ores was unprecedented in its scope. One result was that domestic resources of known deposits were outlined more fully than ever before. In addition, at least two interesting discoveries were made in the United States. These still unproven but potentially significant finds are the Caribou Mine in Boulder County, Colo., in which pitchblende was found and the copper-uranium sedimentary deposits of White Canyon in southeastern Utah.

World-Wide Activity on Atomic Energy

Some significant reports point up the international interest in uranium minerals.

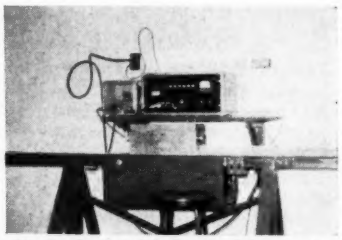
In Canada the government has initiated a program to encourage uranium prospecting by private companies. Although, in general, the Canadian program is quite similar to that of this country, the Canadian Government offers a single established figure of $2.75 per pound contained U_3O_8. Another difference between the Canadian program and that of the United States is in the matter of uranium prospecting on public lands.

The *Australian Government* has announced control of uranium and thorium ores and financial aid to four Australian states in the search for uranium ores; the states of New South Wales and South Australia are paying their own costs. The Australian Government has also guaranteed payment of up to £40 per ton for uranium-bearing ores.

France has established an Atomic Energy Commission responsible for atomic energy development and control of raw materials. It has established two atomic energy development centers, begun the development of uranium ores in France and Colonial areas, and completed one experimental uranium pile and begun construction of a second.

Great Britain has announced government control of atomic energy development, the production of significant quantities of uranium metal, and the completion of two piles. Active exploration for raw materials is under way throughout the British Empire.

Norway has announced regulation of uranium exports, the beginning of uranium mining operations, and plans for three "atom smashers" and an atomic pile.



U. S. Geological Survey lab counter in action

Atomic Energy Inc., a stock company under government control, was incorporated in Stockholm, *Sweden*, in January 1948, as proposed by the government's Atomic Energy Committee. It aims to explore for, develop, and extract raw materials and build experimental piles and later larger piles for research and industry. Plans are nearing completion for uranium extraction from Sweden's oil shale ("Kolm") deposits.

Official spokesmen for the government of the *Union of South Africa* have announced the existence of uranium in the Rand gold ores and the early expected adoption of an Atomic Energy Bill establishing a board to control prospecting, mining, and treatment of uranium and thorium ores.

India has announced its decision to set up an Atomic Energy Commission under the Atomic Energy Act which will carry on exploration for and development of raw materials and promote research. Strict control has been placed on the raw materials for atomic energy.

Poland, China, Brazil, and *Argentina* have announced the initiation of special research projects on atomic energy and have shown intense interest in the raw material supply possibilities of their respective countries.

Spain, Portugal, and *Mexico* have announced nationalization and/or strict control of deposits of radioactive materials.

Numerous reports from Europe have pointed up the extensive mining efforts carried on by thousands of Germans and Czechs in the Bohemia-Saxony uranium-bearing border region of *Czechoslovakia* and the Soviet occupation zone of *Germany* and the apparently tremendous effort of the *Soviet Union* in atomic energy research.

Thorium for Research

The part uranium plays in the development of atomic energy is quite clear. Not so apparent is the role of thorium, the other radioactive mineral placed under the control of the U. S. Atomic Energy Commission by the Atomic Energy Act of 1946. It seems likely that sometime in the future thorium may become an important source of fissionable material—that is, capable of being used in an atomic bomb or for the production of atomic power. However, this is not definite at the present time, and the Commission, while it does maintain control over these materials through its licensing functions, is not stock-piling thorium-bearing ores. Thorium purchases by the Commission are today limited to thorium salts and for research purposes.

The principal source of thorium is the mineral monazite which is commonly found in river placers and beach and sand deposits in association with other heavy minerals. Monazite is, in addition, the only commercial source of cerium and other rare-earth elements essential to many industries, and is in considerable demand by the rare-earths industry. Anyone who may discover a monazite deposit would find it to his interest to communicate with the companies who purchase that material. The Atomic Energy Commission will be glad to assist by examining and assaying samples and by supplying names of possible purchasers.

The position of the U.S. Atomic Energy Commission as regards the discovery, development, and production of uranium ores has been made clear. The Commission feels certain that this can best be done by competitive private enterprise under the stimulus of profits. Its programs are based on this belief, which is the underlying principle of the economic life of this country. Every effort is being made to fit the uranium program within this traditional American way of doing business.

Advancement in Underground Metal Mining Practice*

Refinements in Application of Existing Methods and Equipment Mark Year

CHARLES L. PILLAR
Magma Copper Co.

FOR THE most part, the past year has been characterized by general improvement in operations by working out practical applications and operating details for methods and equipment previously introduced. Most operators are placing more stress on a closer technical control of routine operations to insure correct application and desired results. This has been particularly true in drilling, blasting, loading; supporting ground with timber, steel, or concrete; and sealing off ground water by grouting.[1]

A general increase in the use of mechanized equipment for loading and transporting ore has virtually eliminated hand mucking and tramming except in small mines and prospects. The problems of increased underground maintenance facilities and a need for additional and better trained personnel has developed.

There has been increased application of remote control and automatic equipment to conserve manpower and increase the speed and efficiency of normal operations. There we have been mainly confined to the operation of ventilation doors, switch alignment, chute loading, and car dumping facilities in mine haulage; the operation of shaft doors and skip loading in hoisting; the starting, stopping, and protection of conveyor belt systems; and for the control of fans and pumping units.

Research Aids Development and Application of Methods and Equipment

Some mining companies have maintained research departments to analyze and evaluate the introduction of new methods and equipment into their operations. Their primary function is to increase mine efficiency through improving older practices or devising new ones to boost stope production or development advance per man shift. Objectives are being reached by improving equipment, both in speed and capacity, and reducing maintenance by operational changes. Obvious results and more progressive management are gradually "beating down" the old difficulty of selling new ideas in mining operations.

Training Programs Increase Efficiency

Job training programs are being more widely used to increase the safety and efficiency of both workers and supervisors. The shortage of trained miners prevalent throughout the industry[2] has made such programs essential. They range in scope from a thorough school to the more simple procedure of placing untrained men as apprentices to work with reliable, experienced miners.

Some companies have had gratifying results in the advanced training of experienced men and supervisors in safety work planning and efficiency, the proper use of new techniques and methods, and the operation, care, inspection, and maintenance of new equipment.

Lining up to drill a 9 by 9-ft heading with boom-type jumbo

Rock Drilling Progress

Extensive experimentation with tungsten-carbide bits was carried on in 1948, with both good and indifferent results. One authority states "that the introduction of a tungsten-carbide cutting edge to a rock drill bit involves much more than a simple substitution of a carbide-tipped bit for a steel bit.[3]

"Such factors as the design of rock drills, drill feeds, and bit attachments have to date prevented the full advantage of the tungsten-carbide bit from being realized." Average experience with the bits to date shows a bit life ratio with steel bits of 100 to 1 in very hard rock, 45 to 1 in hard rock, 30 to 1 in average rock and 20 to 1 in soft rock. Tungsten-carbide bits are reported to give an average increase in drilling speed over steel bits of 67 percent in very hard rock, 75 percent in hard rock, 50 percent in average rock, and 40 percent in soft rock. To date, the total bit cost ratio between the two is roughly 100 to 1.

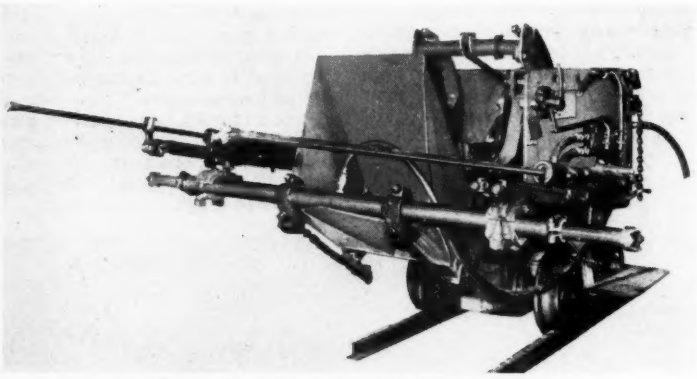
The Liddicoat slip-on, "one-pass" steel bit has shown a substantial gain. The difficulty of freeing bits has been overcome by holding closer tolerances in both bits and rod ends. In addition, the use of improved bit pullers has been fairly effective. A large copper mine in the southwest, which recently changed from conventional forged steel to the Liddicoat bit, reports an increase of 124 percent in drill footage per bit with an increase in drilling speed of 20 percent. Final lines in the rock drill bit picture are

* Significant open-pit developments of 1948 will be presented in a subsequent issue.

yet to be drawn but recent years are marked by notable progress. An improvement in the quality of the tungsten-carbide bit would make it a stronger contender for the hard rock field. The economics in drilling in average or soft rock tend to favor the steel bit.

Alloy steel for drill rods is being used by more mines. Long, air-powered, chain-driven wagon-type feeds for mounted rock drills, particularly on jumbos, are gaining in popularity. Some operators find the practical length of drill feeds is determined by the rod breakage factor, and that feeds over 6 ft in length are not practical due to excessive rod breakage. Several drill manufacturers have introduced 48 in. long aluminum shells on conventional drifters.

A number of manufacturers are bringing out new rock drills which will be lighter and faster. Emphasis is placed on air consumption efficiency, increased drilling speed, and ease of operation.



Bar mounted on shovel dipper converts it into a two-drill jumbo

Use of Jumbos Increases

A wider use of jumbo drilling in horizontal development and stoping operations is evident. However, in some instances jumbo drilling has been a disappointment, particularly in mines where heading clean up has been slow. Under such conditions, the column or bar-mounted drill can be set and most of the heading can be drilled by the time the muck pile has been removed.

Two new types of jumbos have been announced during the year; a mechanical operated jib with centralized controls for air-powered boom arms, feeds, and drills; and another, a modification of an air-powered drift loader, has a horizontal bar mounting two conventional auto-feed drifters attached to the dipper. The bar has two telescoping ends and is held against the drift sides by air pressure. The entire drilling assembly is moved in and out of the heading by the loader, and can be quickly removed or attached.

Open-stope operators have made the greatest use of stope jumbo drilling.[4] Compact, flexible, self-powered units mounted on rubber tires or tracks have been built to fit specific conditions. Units are moved by their own power into a face where the entire heading is drilled, loaded, and blasted in one continuous operation. Headings as large as 25 ft high and 60 ft wide are being drilled successfully.[5] An open stope zinc operator in the Tri-State District reports construction of five- to six-ton self-powered drill jumbos at a maximum cost of $5000 exclusive of rock drills. To date, jumbo drilling there has shown 130.0 tons per drill shift as compared to 58.0 tons per drill shift by the conventional post-mounted drilling. Other factors in addition to the use of jumbos contribute to the excellent results. In southeast Missouri experimental work is being conducted to determine the proper size of drill hole, amount of burden, and average breaking angle between the hole alignment and rock face for producing the most economical drilling results.

Diamond Drills in Ore Breaking

Diamond drill application for underground drilling operations is improving, both from a cost standpoint and increased use for long-hole blasting.[6] Operations in northern Michigan use long hole sublevel stoping and sublevel slicing to gradually replace the old form of top slicing with a net saving in timber, timbering costs, as well as a higher production per man. The diamond drill has proven efficient in the removal and recovery of ore pillars. A few block-caving operators have been experimenting with the use of long-hole diamond drill blasting to create zones of weakness along block or panel caving boundaries. They also use diamond drills to assist caving in blocks of ground that cannot be caved by conventional undercutting methods.

In some types of ground the use of hard alloy insert bits has done much to reduce drill bit costs. One mine reports a reduction in cost per foot of drilling for diamond drill bits from $0.68 a foot with diamonds at $8.50 per carat, to $0.04 a foot by the use of hard alloy insert bits.

Rock drilling by jet piercing has shown improved development during the year, but its use in underground operations is, to date, not applicable.

New Blasting Caps Improve Fragmentation

A series of nine accurately timed, fast delay electric blasting caps was introduced late in 1948. It is too early at this time to present any definite results, but considerable experimental work has been performed in underground blasting operations with the first fast delay detonators of three periods. These were originally brought out to meet a definite need for short interval firing in quarries and construction work. From this work it was recognized that additional delay periods were needed, and blasting intervals should be reduced to less than 40 milliseconds. Experiments have shown: increased fragmentation with resultant reduction in secondary blasting; reduction of bootlegs and practical elimination of unexploded powder in the muck pile; reduced vibration and concussion.

Open stope and sublevel operations are improving the efficiency of blasting operations. Mines in southeast Missouri have conducted experimental work to determine the relationship between the size of drill holes and the powder factor per ton of ore broken. Tests have been conducted to determine the percentage of the powder column in relation to the total length of the drill hole. Potash mining operations at Carlsbad, N. M., have found that the greatest explosive efficiency will be produced by using the largest possible powder cartridge that will fit the drill hole without undue loading difficulties.

Loading Devices Save Labor

For shaft mucking the Riddell mechanical mucker has proven to be practical, reliable, and economic when only temporary or no ground support is required in the bottom 20 ft of the shaft. Several other modified forms of clam-shell mucking have recently made their appearance. Stationary mounted hoists have been located 50 or 60 ft above the shaft bottom. The clam is swung to its desired position across the shaft bottom like a pendulum. Buckets, skips, or trays are loaded in a conventional manner by signals from the men in the bottom to the clam hoist operator above. Sinking operations in the Mather B shaft are using this method with a hydraulically operated clam-shell.

The Boskovich mucker, recently used to sink the main shaft of the Mayflower mine at Park City, Utah, was introduced during the past year.[7] The mucker is a power-shovel dipper suspended below a mine cage. A comparison of performance records before and after installation of the machine indicates an over-all increase from 0.16 to 0.28 of a foot advance per man shift worked. Buckets mucked per man shift increased 70 per cent.

An inclined mechanical shaft mucker has been developed at Bunker Hill [8] for sinking an auxiliary shaft. The machine is a self-loading skip, good for 400-ft lifts. Two machines, one in each hoisting compartment, will be used on a 50-deg incline.

The machine itself consists of a main frame mounted on trucks with the upper end attached to the hoist rope. A steel section telescopes inside the main frame on the lower end of which the digging bucket is mounted. The machine is lowered to the bottom fully extended to engage the muck pile. Air is connected to power the telescoping section and retract it to cause the digging bucket to rotate and dig into the muck pile. The bucket loaded, the air connection is broken, and the machine hoisted. The bucket is dumped into a conventional pocket in the footwall of the shaft by extending the telescoping section.

Slusher Loads Trackless Mucker

A self-loading transport is a new development in a loading machine for drift and stope operations.[9] It is claimed that this trackless machine can clear and grade its own roadway, load and grade when the muck is scattered, and clean up whether the muck is inches or feet in thickness. In operation, the self-loading transport is either pulled forward by the slusher cable, or pushed by a tractor unit from the dumping point to the muck pile. The dipper is crowded into the muck pile, and when full, elevated by its slusher hoist which folds and crowds the dipper load into the transport compartment.

A modification of the rocker-type air shovel mounted on tractor treads is either Diesel or electric powered with full hydraulic variable speed control. This unit has a maximum capacity of five to six tons per minute under the most favorable conditions. It weighs 12 tons, and can travel over rough rock under its own power at a speed of from 120 to 240 ft per minute. It utilizes a 1-cu yd dipper.

The new improved Joy loader, Model 18-HR, for heavy metal mine service, has shown increased popularity and has proven itself a dependable efficient loader for large scale operations. Lead mines in southeastern Missouri have installed 12 units.

Today the Eagle-Picher Co. uses high capacity equipment to move ore quickly

Muck Moving Advancements

During 1948, the Sherwood Mine of the Inland Steel Co. placed in operation a complete conveyor belt system for the horizontal transportation of an expected 5,000,000 tons of ore on the 1200 level.[10] The system is fed by a parallel series of short shakers on approximately 120-ft centers. These transport ore direct from the stope draw chutes to the conveyor belt to be transported to shaft pockets for skip loading. Where shaker lines exceed 200 ft, auxiliary feeder belts have been installed in the transfer subs. The system was installed with a capital expenditure of roughly 50 per cent more than would have been required for a trolley locomotive and tram car installation. Anticipated reduction in operating costs are expected to justify the additional expendtiure.

There is an increased use and a definite trend toward trackless haulage in mines where conditions are favorable. Operators state that both electric-powered shuttle cars and Diesel-powered trucks show promising results in development work and in gathering and main haulage. Usage to date has been mainly confined to open-stope operation. Great flexibility and low operating cost make it attractive for possible use in other types of underground operations.

Diesel Power Underground

The use of Diesel-powered haulage equipment continues to show a steady increase.[11] Diesel locomotives have been used successfully in European mines for the last 20 years and over 1300 such units are now in use. Diesel engines of suitable construction can be used safely in underground mines if adequate ventilation is provided and the equipment kept in good repair. Vigilant supervision and constant checking of the effectiveness of the ventilation and the condition of the equipment is a must when using Diesel power underground. Diesel-powered equipment in underground use in this country include: trucks, locomotives, shovels, air compressors, tractors and bulldozers.

Electric-powered rail haulage has tended toward higher speed and lighter cars designed to carry greater pay loads. The increased use of such equipment as trolley telephone, electric eyes, electrically thrown switches and ventilation doors, and automatic warning and signal systems are consistently improving haulage operations through the industry from both a standpoint of safety and efficiency. Although pioneered by the coal mines,

the use of continuous welded rails on main high speed haulage lines in metal mines is receiving more favorable consideration with the advantages of better conductivity, smoother riding, and lower maintenance costs.

Conveyors for Ore Hoisting

Conveyor systems, in place of conventional skip hoisting for elevating ore to the surface, are receiving increased consideration in present-day planning. The Consolidated Mining & Smelting Co.'s Sullivan mine in British Columbia has had in operation for several years a six-section conveyor system 2548 ft long which raises ore through a vertical distance of 680 ft to the main haulage adit.[12] This conveyor system is now successfully handling about 40 per cent of the mine's production or approximately 3500 tons per day.

The advantages claimed by conveyor systems in general are: reduced peak starting load; flexibility, additional depth may be reached by adding units; and the conveyor system ties in with the ore transportation system at both ends.

Among its disadvantages are a set capacity in tons per hour and the high replacement cost of the thing.

However, continued improvement of conveyor belts and new techniques in loading, protection, and maintenance is doing much to increase belt life and make conveyor systems a major contender for the economic hoisting of metallic ores under certain conditions.

Conventional skip hoisting practices have shown improvement with the extended use of larger capacity skips and faster hoisting speeds. The use of steel guides with rubber-tired wheels replacing the conventional guide shoe have helped increase hoisting speeds with a reduction in maintenance costs. The use of high-strength, alloy steels with reduction in over-all weight and increased resistance to corrosion and abrasion as well as the use of aluminum alloys in the fabrication of skips and cages has contributed to bettering the efficiency of present hoisting systems.

Anaconda's bottom-dump skip with its advantage in dumping ease and handling sticky ore has now been installed in most of the larger mines in the Butte District. Tennessee Copper has introduced an improved wedge-type safety dog on a large supply and man cage. The use of both radio communication and radio bell signals in hoisting operations is growing. Increased safety and efficiency particularly in shaft inspection, repair, and maintenance operations has been noteworthy.

Poured and Precast Concrete for Ground Support

Both reinforced and plain concrete to support and line permanent mine openings, development, and extraction openings is being used to replace conventional timber support. Concrete support has been primarily confined to ground that has sufficient structural strength to support itself entirely if it can be held in place by preventing local sloughing.

At Climax, Colo., the use of a surface aggregate batch plant, with special cars for transporting and placing accurately weighed amounts of aggregate into an underground mixer, and the feeding of mixed concrete by belt conveyor to a Pumpcrete machine for placing behind readily assembled and disassembled steel forms has placed their underground concreting operations on a production line basis with a resultant reduction in both cost and labor.[13]

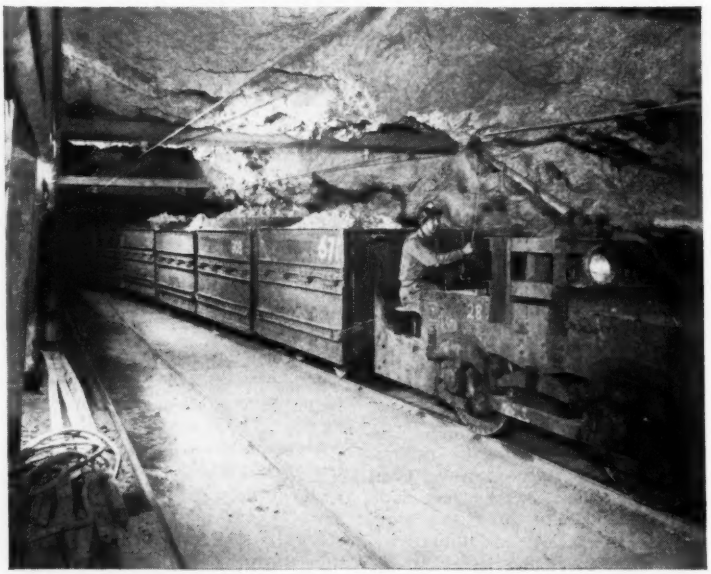
For small inaccesible operations, clean waste rock has been satisfactorily used for aggregate to make a low strength concrete. The Ray mine has obtained satisfactory results by using this procedure to place concrete sill pads in the grizzly drifts under draw sets.

In heavy or moving ground, timber remains the only satisfactory method of support. Its application has been improved by better designed sets to meet particular conditions. Anaconda's octagonal raise set, back filled with sand, and Magma's heavy ground sill set [14] are recent examples showing improved results over the older, conventional-type sets. The use of tough, flexible, small pole lagging, cedar squeeze blocks, and steel angle brackets to eliminate set framing or timber scabbing have all added to the betterment of timber support.

Precast concrete blocks keyed together to form a circular lining for both drift and shaft development are being used at the Cyprus mines.[15] This method was introduced to obtain smooth lined galleries for ventilation, to reduce the fire hazard of timber support, and because cement was relatively cheap and plentiful. It is necessary to back fill between the precast blocks and the ground in order to maintain the desired circular section. In average ground blocks 8 in. thick have been satisfactory. In moving ground, when concrete blocks have failed, wooden blocks have been substituted.

When light support and protection from local sloughing is required, the use of light steel or aluminum drift sets has shown increased use, a 6 by 6-in. steel H beam being comparable in strength to a 10 by 10-in. timber. Steel is being used more to replace timber in top slicing operations both for primary ground support and matting particularly where rapid oxidation of heavy sulphide ore constitutes a serious fire hazard.[16]

In sinking operations at San Manuel No. 1 shaft a ½-1-in. coating of gunite is applied to the vertical shaft walls as soon as the ground is open. The gunite is applied for a vertical distance of 20 ft at a time, from the bottom of the shaft steel to the muck pile. In dry, weak, short but not heavy or moving ground, this lining has been adequate temporary support against sloughing and allows the preparation of 40-60 ft of vertical shaft for the placing of the permanent concrete lining. The gunite is placed by the regular six-man shaft crew requiring approximately one operat-



With the junking of the last compressed-air locomotive in 1948, Inspiration's underground haulage system became completely electrified

ing shift to place 20 ft in an 8- by 28-ft rectangular section.

Mine Pump Controls

Electronic control applied to automatic mine pumping was introduced at the Fad shaft of the Eureka Corp., Ltd. at Eureka, Nev.[17] An electronic water-level indicator was developed to replace conventional float switches, the weakest link on previous automatic systems. The control consists of an electronic relay connected to the input circuit of the system with stainless steel probes inserted in the sump. The pumping power circuit is controlled through an electromagnetic relay which in turn is controlled by the electronic relay that is controlled by the high resistance contact between the steel probe and sump water. Early tube failures in the electronic relays were not encountered and the system was properly maintained by regular mine electricians who had no previous experience with the automatic system.

Ventilation and Air Conditioning

The new cooling system at the Magma Copper Co., Superior, Ariz., was placed in operation August 26, 1948 with the first underground unit located on the 4200-ft level. A large surface tower cools 1720 gpm of water from 85 F to 62 F when air entering tower precooler coils is 100 F dry bulb, and 70 F wet bulb. Roughly 573,000 cfm of air can be drawn through precooler coils and discharged at the top of the tower. Approximately 1650 gpm of water can circulate through the precooler coils and go to the top of the tower with 1720 gpm of mine water, which has been heated in the heat exchangers underground for evaporative cooling.

After the system had been in operation for 24 hours the temperature of the mine air on the 4200-ft level in the vicinity of the first cooling unit was lowered from a wet bulb of 94 F, dry bulb 111 F to a wet bulb of 67 F, dry bulb 72 F. The No. 2 unit on the 4200-ft level was placed in operation September 4, 1948. The first cooling unit on the 4400-ft level was placed in operation December 13, 1948. A second unit will be installed on the 4400-ft level and two units on the 4600-ft level making a total of six underground units to complete the system. Each underground unit is composed of: a water-to-water heat exchanger; a 25,000-cfm fan, a 215-gpm circulating pump; nine cooling coils; an air washer with sprays; eliminator plates, and a 100-gpm circulating pump.

Adequate ventilation can practically nullify the dust hazard which prevails in most underground operations. On this premise, Climax has introduced exhaust ventilation laterals in their block-caving operations. These laterals are small 5 by 7-ft drifts driven along the block boundaries just under and perpendicular to the slusher drifts. These laterals connect the ends of the slusher drifts with the major exhaust raises and are sealed from all other mine workings. This allows a free circulation of air through the haulage drifts up into and through the slusher drifts and out the ventilation laterals to the surface without recirculation or contamination of the regular mine atmosphere. Severe dust conditions caused by heavy drawing and scraping in these slusher drifts are immediately exhausted away from the men and other working places into the ventilation laterals.

There is a marked increase in the use of small auxiliary compressed air blowers to improve ventilation. Compressed air operated auxiliary blowers have been introduced during the past year. They have been found effective but not too efficient in their use of compressed air.

Mass Mining Low Grade Ores

Advancement in mining methods has followed the pattern of mass production. The successful application of bulk underground mining methods is typified by Bunker Hill & Sullivan's planned caving program at Kellogg and Anaconda's Greater Butte project, both in districts that previously used selective mining methods. Successful experimental work has been conducted in the block caving of sticky, heavy iron ores by Cleveland-Cliffs Iron Co. in northern Michigan operations to replace top slicing and sublevel stoping. The recent introduction, in both open and sublevel stoping operations, of mass production methods, particularly in the drilling, blasting, loading, and transportation phases has shown a substantial increase in efficiency and lower operating costs.

In the Greater Butte project, initiated in 1947, former openings, old gobs, and mined-out areas within the project boundaries are being filled with wet mill tailings under pressure.[18] It is estimated that some 9,000,000 tons of these tailings will be required and are to be pumped at the rate of 9000 tons per day. The filling will remove any hazard from underground fires such as have occurred in abandoned areas in the past. It will also serve to cool the working places and improve general working conditions. At the same time it will serve to consolidate areas formerly filled with broken waste, thereby contributing to the safety of the operation.

Acknowledgment is made to the many individuals and companies throughout the industry for the data, information, and opinions that they have so generally supplied. Their excellent cooperation has greatly assisted in the preparation of this review.

1 R. H. Allen, J. W. Golpin, "An Example of Controlled Pre-Grouting in Shaft Sinking," AIME TP 2427, September 1948.

2 L. F. Bishop, "How Anaconda Trains Employes to Work Safely and Efficiently," *E. & M. J.*, August 1948.

3 Blair Burwell, "A Summary of Experience in the Use of Tungsten-Carbide Bits in Rock Drilling," MINING CONGRESS JOURNAL, November 1948.

4 S. S. Clark, "Use of Jumbo Drilling Machines in the Tri-State District," AIME TP 2294, March 1948.

5 Tell Ertl, "Oil Shale Mining," AIME TP 2359, July 1948.

6 L. S. Chabot, Jr., "Diamond Drill Blasthole Stoping at the Book Mine, Menominee Range," AIME TP 2305, January 1948.

7 John B. Huttl, "Power Shovel Principle Is Used in Shaft Muckers," *E. & M. J.*, January 1948.

8 R. W. Lottridge & R. W. Neyman, "Shaft Sinking in the Coeur d'Alene Mining District," MINING CONGRESS JOURNAL, November 1948.

9 D. I. Hayes, "An Underground Self-Loader," MINING CONGRESS JOURNAL, November 1948.

10 P. D. Pearson & R. O. Marsten, "Underground Shaker and Conveyor Belt Hoisting," MINING CONGRESS JOURNAL, October 1948.

11 J. H. East, Jr., & E. R. Maize, "Diesel Power for Underground Haulage," AIME TP 2384, July 1948.

12 "Belt Conveyor Hoisting," *Mining World*, March 1947.

13 Robert Henderson, "Concreting Practice at Climax," MINING CONGRESS JOURNAL, September 1948.

14 J. L. Draeger, "Drift Timbering in the Magma Mine," Arizona Section, AIME, November 1947.

15 J. L. Bruce and G. W. Nicolson, "Concrete and Wood Blocks for Ground Support in Cyprus Mines," AIME TP 2413, July 1948.

16 J. L. Bruce, G. W. Nicolson, and J. G. Tate, "Use of Steel in Top Slicing," AIME TP 2458, September 1948.

17 L. Hanson and W. B. Clark, "Electronic Control Applied to Automatic Mine Pumping," *E. & M. J.*, November 1948.

18 E. S. McGlone, "The Greater Butte Project," *E. & M. J.*, September, 1948.

A 25-yd walking dragline removes overburden for a 5-yd coal shovel

Strip Mining Coal in 1948

The Market Demand for High Quality Is Being Met By Increased Coal Preparation Facilities in the Strip Mining Fields

By HARRISON EITELJORG

President
Morgan Mines, Inc.

IN 1948, the strip coal mining industry experienced a complete reversal of objectives. The unprecedented market for coal which existed during 1947 continued over the first half of 1948, but the demand was for production and more production, with quality as a secondary consideration. Tipples and preparation plants were crowded to the very limit of their capacity. Straight run-of-mine coal and mine-run even partially screened or partially hand picked was selling at a premium. New stripping equipment was on slow delivery, and second-hand equipment was difficult to locate. Then came the change; the softening of the market about mid-year was accompanied by a demand for better coal and better preparation. There was no outlet for mine-run; consequently, new tipples, washing plants, dryers and preparation installations of all kinds to improve coal quality were being rushed to completion. The demand for stripping equipment, except in the large capacity machines, eased off as the emphasis shifted to coal quality.

Strip mining has become recognized as one of the most important branches of the coal industry and, in 1948, open-pit operations produced 138,000,000 tons or 23 percent of the total U. S. production of bituminous coal. We are all familiar with the history of the past few years, particularly during the war, when the need for coal and a desire to keep their equipment busy attracted many road builders and other dirt-moving contractors into strip mining—either on their own, or as contractors for deep mining companies. These newcomers have been credited for much of the increased strip tonnage in the war years, but in reality the older established operators contributed the greatest actual increase. The truth of this statement is borne out by the continued growth in production which strip mining has maintained from the very beginnings and a brief review of this growth may be of interest.

We have no record as to when strip mining was actually begun—probably it was the earliest form of coal mining, and the date of its origin may be some hundreds of years ago. However, coming to our own times, and in our own country, the records show that as early as 1914 there was a strip production in the U. S. of well over a million tons—produced by some 48

The trend is toward deep cover and large capacity equipment

power shovels and draglines, and contributing 0.3 percent of the total bituminous tonnage. By 1928, this production had reached almost 20,000,000 tons and, from that point on, the progress is shown in the accompanying table. This covers the four major stripping fields of the United States: (1) The Appalachian, which includes Pennsylvania, West Virginia, Ohio, and Kentucky (both eastern and western), (2) Illinois-Indiana, (3) Missouri, Kansas and Oklahoma, and (4) the Rocky Mountain states of Montana and Wyoming. The total strip mining tonnage shows fluctuations over the years which paralleled the rise and fall of the annual U. S. production, but in percentage, the strip tonnage growth has been consistent and steady.

Figures for 1948 are not yet available, but a summary for 1947 shows the following: In the Appalachian states, 19.3 percent of the bituminous production is mined by stripping; Illinois and Indiana produced 35.1 percent from open pits, and the Rocky Mountain states of Wyoming and Montana produced 14.3 percent of their tonnage by this method. First place, however, goes to the Trans-Mississippi states of Missouri, Kansas and Oklahoma, where 82 percent of their production is by strip mining.

Considering the various fields, the greatest increase has been in the Appalachian states, amounting to twenty-fold since 1928. In this area, most of the stripping is along the hillside outcrops where there is shallow overburden, and from the table, it will be noticed that most of the increase has occurred within the last five years. The stimulus of war production, which encouraged the start of many stripping operations in this area, showed the possibilities for cost reduction and the development of mechanical cleaning put the stripped outcrop coal on a competitive quality basis with the deep mined production.

The Middle West, that is to say Illinois, Indiana, and the Trans-Mississippi states of Missouri, Kansas and Oklahoma, were the fields where strip mining was actually developed. Their production has grown at a steady rate which is still continuing, and their operating methods have reached a high degree of efficiency. In the early days, most of the strip coal had shallow overburden, but these areas have been exhausted, and the future of the industry in the Middle-West lies in its ability to handle heavier overburden more efficiently and at lower cost. Toward this end, the equipment manufacturers are developing new machinery and re-designing older models.

Marion Power Shovel and the Bucyrus-Erie Companies have made tremendous improvements in the speed, capacity and stability of the larger shovels and draglines; these two companies, together with Page Engineering Co., have also perfected medium size (7-15 yd) walking draglines that are proving fast and effective. Lightweight metals and alloys are being used for booms, buckets, and dippers. An improved version of the digging wheel made its appearance in 1948, and the old tower excavator is being revamped and rejuvenated to assist in handling heavy overburden. These two types of machines are used only for benching at the present time. To fill the need for a "big" little stripper, Manitowac brought out the first models of its 5-to-6-yd track type dragline in 1948. This same machine will be built as a high lift shovel with a 60-ft boom and a 40-ft stick. Lima is also building a machine in this size and range, and certainly other manufacturers will follow suit. Improved haulage units have been made to reduce the cost of bringing coal from the pit to the tipple, and several new types of drills for overburden, both horizontal and vertical, have recently appeared.

The new developments in underground operation technique, such as continuous mining, are being watched with great interest by the strip industry. As long as coal remains competitive, increased efficiency underground will be met by a corresponding increase in open-pit operation.

STRIP MINE TONNAGES IN THE MAJOR BITUMINOUS FIELDS

(Expressed in Thousands of Tons)

	Appalachian	Illinois-Indiana	Mo.-Kans. Oklahoma	Rocky Mountain	Total U.S. Stripping	Percent of U.S. Production
1928	4,163	9,162	3,500	1,181	19,879	4.0
1929	2,382	10,947	4,774	1,219	20,268	3.8
1930	1,543	11,630	3,480	1,065	19,842	4.2
1931	1,159	11,593	3,778	819	18,932	5.0
1932	1,030	12,341	4,031	862	19,641	6.3
1933	1,167	10,680	3,845	804	18,270	5.5
1934	1,392	12,120	4,242	1,114	20,789	5.8
1935	2,211	13,902	4,390	1,142	23,647	6.4
1936	2,754	16,757	4,830	1,225	28,125	6.4
1937	3,323	19,730	5,086	1,366	31,751	7.1
1938	4,492	18,042	3,845	1,341	30,406	8.7
1939	7,912	20,955	4,745	1,362	37,773	9.6
1940	10,379	23,089	5,356	1,418	43,167	9.4
1941	16,961	26,121	6,070	1,479	55,072	10.7
1942	22,019	29,782	7,060	1,893	67,202	11.5
1943	35,397	29,910	9,866	2,893	79,685	13.5
1944	52,471	32,106	8,782	3,101	100,895	16.2
1945	62,442	30,373	8,076	3,463	109,897	19.0
1946	68,841	26,988	7,296	3,601	112,964	21.1
1947	88,140	31,912	8,623	3,534	139,395	22.1
1948	Figures not available			(Preliminary)	138,000	23.2

A lateral from the Carlton Tunnel will drain and permit mining on lower levels of the Cresson Mine, Cripple Creek, Colo.

Gold Policy Needs Realistic Revision

Production Falls Slightly Due to Lack of Relation Between Price and Production Costs—Unrestricted Market Offers a Solution

By ROBERT W. BACHELOR
Director of the Research Council
American Bankers Association

WORLD PRODUCTION of gold outside the USSR in 1948 approximated $800,000,000, a slight increase over the estimated figure of $775,000,000 for 1947. World gold production reached a low in 1945, but has been steadily increasing since that year, notwithstanding rising levels of costs, coupled with a fixed price for gold in the United States where most gold production of the world is marketed. Many countries have directly or indirectly subsidized gold mining in order to obtain a supply of dollars.

Gold output increased in Canada and India, there was some decrease in Australia, and no apparent change in production in Africa. Annual marketing of gold has been decreasing slightly each year since 1941 in South Africa, West Africa, Rhodesia, and the Belgian Congo. The development of new gold fields in Africa may account for the lack of further decline and may represent a turning point in production on that continent.

Production of gold in the United States was approximately $69,000,000 compared with $75,787,000 for the year 1947. California, Utah and South Dakota each produced a monthly average of about 35,000 oz of gold, while the average for Alaska, subject to extreme seasonal fluctuations, was less than 25,000 fine ounces. Colorado production in 1948 averaged less than 13,000 fine ounces. Production in the states of Arizona, Montana, and Nevada fluctuated between 6000 and 10,000 oz per month each, on an annual basis.

Profits Have Declined

Gold mine operators have been pinched between rising wages and costs of supplies and services, and a fixed price for their product.

Corporate profits of all industries in the United States, after taxes, are estimated by the US Department of Commerce as $8.4 billion in 1929. For each dollar of profits earned in 1929, all industries earned $1.12 in 1941, $1.52 for the year 1946, and $2.15 for 1947. In contrast, for each dollar earned by metal mining corporations in 1929, they received 82c in 1941; 36c in 1946, and 86c in 1947. Separate figures for gold mining are not available, but examination of statements of individual mining companies shows that the record is far below that for metal mining generally.

Traditionally, gold-mining companies suffer in a period of inflation and thrive in times of falling prices. Their present plight could be helped by a decline in prices of materials and labor, a better relationship between production costs and the selling price of gold, or a higher selling price.

Even though materials and labor stay at their present level, producers might be able to lower costs a little more.

The second means of adjusting gold mining to current conditions is to bring about a better relationship between production costs and the price of gold. Some European countries found, both recently and following World War I, that gold can be related satisfactorily to paper money by reducing the amount of paper money outstanding. In some countries it was necessary to reduce the existing amount of currency and bank deposits to as little as one-tenth of those previously outstanding. A few countries had to wipe out old currencies and begin with new series.

No such drastic steps could be considered in the United States. They would involve repudiation by the central government and this would not be supported by public opinion.

Other European countries revalued gold in terms of the existing supply of paper money. Currency and deposits remained in their swollen condition, but the amount of gold represented by each unit was reduced; that is, the price of gold was increased in terms of local currency. More countries may have to do this before their monetary troubles are over.

Some persons advocate this method for the United States. They want a direct devaluation of the dollar, brought about by fixing some new price for gold more or less pulled out of the air, as was the price of $35 a fine ounce in 1933. In a country with an inflation equalled only a few times in our history, this would be foolhardy. It would add to the money supply, and we do not need a larger money supply now. The time and place for a direct and immediate devaluation is a country with a depression well under way.

A Higher Selling Price of Gold

Since it now seems unlikely that production costs will lower much soon, and since it would be undesirable to adjust by law the ratio between costs and the price of gold, the gold producer's problem, actually, is how he can raise his price. Any approach must be through an act of Congress. Some methods can be ruled out at once as not being in the public interest. Though widely advocated, they might not accomplish the results expected, and might impair the ability of the United States Government to meet its financial obligations.

Under what circumstances could producers receive more dollars for each ounce of gold marketed?

Subsidy Would Constitute Treasury Expense

A higher price for gold must not be in the form of an expense to the Treasury and cannot be forced, since the producers and their employes control an insignificant number of votes. Subsidies probably would not be approved by the Congress. There is still too much feeling that gold is useless, and that the United States has too much of it already. Furthermore, most mine operators do not want a handout from the Government. They want only a fair price for their product in a market where the public can express its opinion by buying and selling.

Subsidies have been used chiefly in countries under pressure to obtain gold in order to sell it for United States dollars. The Secretary of the Treasury and the National Advisory Council on International Monetary and Financial Problems are opposed to such subsidies.

Redemption Might Impair Financial Structure

A return to gold redemption of the currency now would be detrimental to the financial structure of this country. Moreover, it would not increase the price paid by the Treasury for gold, nor would it halt inflation. If the United States Treasury were obliged to redeem its currency in gold this requirement would seriously interfere with its ability to manage the public debt, and to keep total interest charges low enough that the voters are willing to pay them.

To maintain stability in the markets for Government securities, the Treasury buys and sells securities held in its many and large trust funds. It also borrows at long term and purchases short-term securities and vice versa. These transactions — through the Federal Reserve banks—also add to or subtract from the money supply of the country.

Federal Reserve banks purchase Government securities by giving checks drawn on themselves. The only thing that can be done with a check drawn on a Federal Reserve bank is to deposit it in one of the Federal Reserve banks, or to take Federal Reserve notes. The notes are an engraved acknowledgment of indebtedness instead of an acknowledgment written on a book of account. The Federal Reserve banks can continue to purchase Government securities until their aggregate deposit and note liabilities are four times their gold certificate reserves. It has been estimated that the Federal Reserve banks could purchase more than $40 billion of United States Government securities before the law would have to be changed again, to permit them to hold a lower percentage of gold certificates to liabilities.

If the Federal Reserve banks were obligated to redeem Federal Reserve notes or any other form of currency in gold, they could not purchase securities, since under gold redemption the liabilities of the Treasury and the central banks have to bear a reasonable ratio to the supply of gold. If the ratio at any time appears unreasonable, the public may request redemption.

Unrestricted Gold Market Offers Solution

There seems to be a definite set of conditions under which gold production can increase; by offering a higher price to producers, without expense to the Treasury, without undesirable inflationary consequences, and without any compromise in the ability of the Treasury to manage the public debt. The only method that meets these conditions is restoration of the unrestricted right of individuals and businesses to own and trade in, and to import and export, gold in any form. The McCarran and Engle bills introduced at the last session of Congress provide for an unrestricted gold market.

A free gold market would further international understanding immeasurably. At various times in past decades, certain countries have been able to maintain the terms of trade greatly in their favor; that is, they have been able to buy imports at low prices and sell exports at high prices. Such times were when England was

Lack of price-cost differential closed the Gold Road property of U. S. Smelting, Refining and Mining Co.

the chief industrial workshop of the world, during the late nineteenth century. Again, in the early 1930's, raw material prices throughout the world fell faster and further than the prices of manufactured goods, and the terms of trade favored the supplier of industrial products. At such times the industrialized countries did not have the most friendly relations with their customers on the unfavorable end of the terms of trade.

Since 1940, and especially since the end of fighting in late 1945, the United States has had a virtual world monopoly on industrial products. The terms of trade have been in our favor because a purchaser cannot get prompt delivery from other supplies. A free gold market would help to ease the onerous terms of trade that most of our customers suffer. They could get a higher price for their gold. Moreover, operating over a long period, a free market would set the appropriate revaluation price for gold. There must be some adjustment of international exchange before peace conferences can succeed. It is time to take the preliminary steps.

Price of Gold in an Unrestricted Market

The number of dollars that might be offered for an ounce of gold on the open market is a matter of conjecture. No one can be certain until trading begins. Gold, like everything else, is worth what people, either individually or collectively, are willing to pay for it.

There are governmental supports under many prices, as well as under gold prices. However, prices of some products have no ceiling. They are subject to fluctuations of supply and demand. Producers have some control over the supply. An owner of farm products, for example, is free to hold or sell his commodities, as he chooses. The miner of gold, on the other hand, has one price that is both floor and ceiling; and he is forbidden by law to hold his product off the market or to sell it at public auction or to private bidders. The only authorized buyer of gold is the United States Treasury.

Some writers seem to believe that an ounce of gold can be exchanged for about the same market basket of commodities now as before the war. They necessarily base their calculations on a limited number and dollar amount of transactions. Press accounts indicate that there is a small traffic in gold dust and small nuggets in the western states, at about $50 or $51 an ounce. One dealer claimed to have $10,000,000 in unfilled orders at this price. The total amount of gold involved, even with the claimed orders, is so small in relation to our monetary gold stock of $24 billion as to be of little significance.

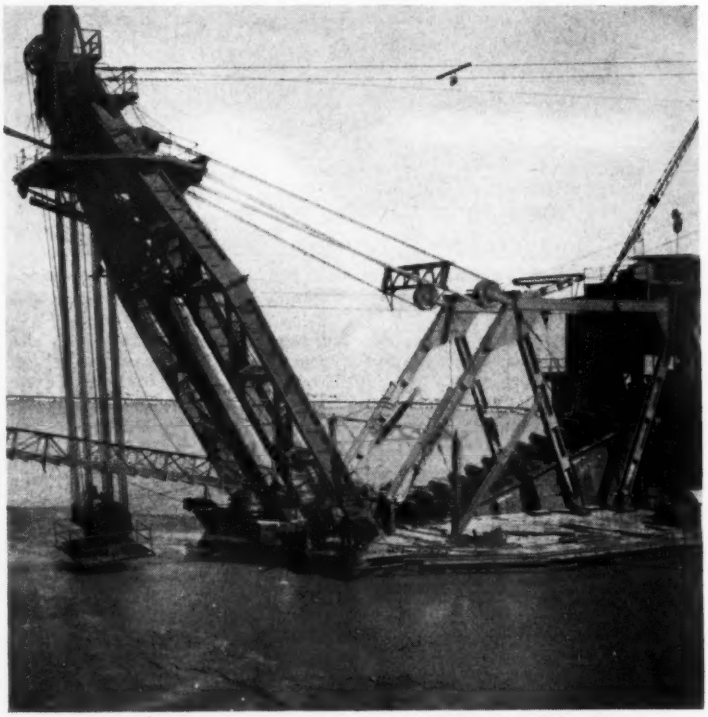
Certain governments sold gold from time to time in 1946 and 1947 and required actual payment in United States dollars. These sales began to meet buyer resistance when the price asked was above $42 an ounce, and for the most part, the sales were made, actually, at about $40 an ounce. Reports from foreign countries usually quote sales of gold in local currencies and then in dollars. These quotations have been between $40 and $80 a fine ounce. The peak of these quotations was reached in late 1945 and early 1946. In most countries the indicated prices have declined during the past two years. There are few instances where quoted prices are higher than in 1946. The significance is not clear, however, since they are computed at the official rate of exchange, which is usually pegged, and exchange is not available to speculators in gold.

Gold was sent to the United States during the past decade because foreigners required dollars in order to buy from the only important country of supply. When production is further restored in other countries, the balance of payments may change substantially. It is not safe to assume that there will be an everlasting demand for dollars or that we will continue to receive the current world output of gold. The supply of gold for an open market may be limited to new mine production in the United States. Likewise, the demand for gold may be greatly reduced as goods become available throughout the world in exchange for currency.

Over the past 200 years, excluding periods of major wars, wholesale prices for the United States have fluctuated between 60 and 80 percent of the 1926 average. The index is about 170 now, but it is likely to be stabilized somewhat lower. With a sea level of wholesale international prices of 70 percent of 1926 prices, there is some reason to believe that a price of about $45 would give gold producers purchasing power equivalent to that enjoyed prior to 1930.

A much higher price for gold would be required to give gold producers purchasing power equivalent to that they enjoyed over the past decade. With a wholesale price level of around

(*Continued on page 75*)



Dredges continue to produce gold from California's Yuba River

Sales of Mechanical Loading and Cleaning Equipment for Coal Mines in 1948*

By W. H. YOUNG and R. L. ANDERSON
Respectively, Chief, Bituminous Coal Section, and Engineer-Economist, U. S. Bureau of Mines

UNDERGROUND MECHANICAL loading equipment shipped to coal mines in the United States was 55 percent greater, in terms of capacity, in 1948 than in 1947. The capacity of mechanical cleaning equipment sold for use at bituminous coal mines was two percent greater in 1948 than in 1947.

Shipments of "mother" conveyors and shuttle cars increased 15 and 62 percent, respectively, over 1947 in 1948.

This survey was made possible by the courteous cooperation of all known manufacturers of mechanical cleaning equipment for bituminous coal and manufacturers of mechanical loading and supplementary haulage equipment for use in all coal mines in the United States; data from various trade journals were also utilized.

Mechanical loading units and supplementary haulage equipment "sales in 1948" represent shipments made during 1948. A small percentage of the mechanical cleaning equipment sold in 1948 was put in operation during the year; the balance will be installed in 1949 and 1950.

Mechanical Loading Continues Upward Trend

Bituminous coal and lignite mechanically loaded in underground mines increased from 245,340,768 tons in 1946 to 298,157,281 in 1947, or 21.5 percent. Mechanical loading in Pennsylvania anthracite mines increased from 15,619,162 tons in 1946 to 16,054,011 in 1947 or 2.8 percent.

Table I shows data on bituminous coal and lignite production by methods of mining and mechanical cleaning for 1946-48, inclusive. Although the total production decreased in 1948 from 1947, the percentage mined by stripping, mechanically loaded, and mechanically cleaned each increased in 1948 over 1947.

Types of units sold—Table II lists the number of units of mechanical loading equipment shipped to bituminous coal, anthracite, and lignite mines for underground use in the United States, 1941-48, inclusive. Each type of equipment showed a large increase in 1948 sales over the previous year. Sales of mobile loaders increased from 486 in 1947 to 725 in 1948, or 49.2 percent.

Total sales by States—The total number of mechanical loading units shipped to the various States in 1948 is shown in Table III. Types of equipment shipped are indicated by letter symbol in approximate order of capacity. For example, 270 mechanical loading units were shipped to Kentucky. Of this total number of units shipped, mobile loading machines (indicated by "L") furnished the largest addition to capacity, followed by conveyors ("C") and scrapers ("S"). Capacities are based on 1947 records of performance, as reported by mine operators. In 1948, 1765 mechanical loading units of all types were shipped to bituminous coal and

TABLE I—BITUMINOUS-COAL AND LIGNITE PRODUCTION, BY METHODS OF MINING AND MECHANICAL CLEANING, IN THE UNITED STATES, 1946-48, INCLUSIVE

	1946		1947		1948[1]	
	Thousands of net tons	Per Cent of total	Thousands of net tons	Per Cent of total	Thousands of net tons	Per Cent of total
Surface stripping	112,964	21.2	139,395	22.1	138,000	23.2
Hand loaded underground	175,617	32.9	193,072	30.6	170,000	28.6
Mechanically loaded underground	245,341	45.9	298,157	47.3	286,000	48.2
Total production	533,922	100.0	630,624	100.0	594,000	100.0
Mechanically cleaned	138,670	26.0	174,436	27.7	175,000	29.5

[1] Preliminary.

TABLE II—UNITS OF MECHANICAL LOADING EQUIPMENT SOLD TO BITUMINOUS-COAL, ANTHRACITE, AND LIGNITE MINES FOR UNDERGROUND USE IN THE UNITED STATES, AS REPORTED BY MANUFACTURERS, 1941-48, INCLUSIVE

	1941	1942	1943	1944	1945	1946	1947	1948	Change 1948 from 1947 percent
Type of equipment:									
Mobile loaders	368	352	234	286	359	495	486	725	+ 49.2
Scrapers [1]	11	29	15	39	26	35	35	49	+ 40.0
Conveyors [2]	2,130	1,491	1,100	708	861	1,157	987	1,209	+ 22.5
Pit-car loaders	10	2	1	....	(3)	(3)	(3)	(3)	——
Total, all types	2,519	1,874	1,350	1,033	1,246	1,687	1,508	1,983	+ 31.5
Number of manufacturers reporting	32	28	24	22	25	24	23	22	——

[1] Reported as scrapers or scraper haulers and hoists.
[2] Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads. Sales of both loading heads and conveyors were counted for 1941, but the figures for 1942-48, inclusive, do not include loading heads separately.
[3] Canvass of sales of pit-car loaders discontinued in 1945.

TABLE III—TOTAL NUMBER OF UNITS OF MECHANIZED LOADING EQUIPMENT SHIPPED FOR USE IN EACH STATE IN 1948

(L, Mobile loading machines; S, Scrapers; C, Conveyors)

State	Number of units of all types shipped in 1948	Types of equipment in approximate order of capacity
Bituminous-coal and lignite mines:		
Alabama	74	C.L.
Arkansas	19	C.L.
Colorado	12	L.C.
Idaho	4	C.
Illinois	50	L.C.
Indiana	16	L.C.
Kentucky	270	L.C.S.
Maryland	1	C.
Montana	1	C.
New Mexico	3	L.
North Carolina	3	C.S.
Ohio	80	L.C.
Oklahoma	18	C.
Pennsylvania	386	L.C.S.
Tennessee	39	L.C.
Utah	21	L.C.
Virginia	55	L.C.
Washington	2	S.
West Virginia	698	L.C.S.
Wyoming	13	C.S.L.
Total bituminous-coal and lignite	1765	L.C.S.
Pennsylvania anthracite mines	218	C.S.L.
Grand total	1983	L.C.S.

lignite mines, compared with 1343 in 1947—an increase of 422 units or approximately 31.4 percent. The total number of units shipped to Pennsylvania anthracite mines increased from 165 in 1947 to 218 in 1948 or 32.1 percent.

Mechanical loading equipment exported in 1948, in terms of capacity, amounted to nine percent of the shipments made to mines in the United States. This is in comparison with 19 percent in 1947.

Types of mechanical loading equipment sold compared with units in use—The trend in demand for various types of mechanical loading equipment is shown in Table IV. At bituminous coal and lignite mines three types of loading devices (mobile loaders, self-loading conveyors, and hand-loaded conveyors) have shown considerable increases in the number in use from 1941 to 1947; the other two types (scrapers and pit-car loaders) have decreased during the same period.

The total number of mechanical loading units of all types in use in Pennsylvania anthracite mines increased from 2937 in 1941 to 4076 in 1948 or 39 percent, compared with an increase of 46 percent at bituminous coal and lignite mines for all types during the same period.

Types of equipment purchased by States—Table V shows the number of mobile loaders, scrapers, and conveyor units shipped into various States during 1948 and the number in use in 1947. West Virginia received the greatest number of mobile loaders, followed by Pennsylvania, Kentucky, and Illinois, in the order named. West Virginia also received the most conveyors, followed by Pennsylvania, Kentucky, and Alabama.

Pennsylvania anthracite mines received 32 scrapers in 1948 compared with 23 in 1947. Conveyor units shipped to anthracite mines increased from 141 in 1947 to 184 in 1948.

TABLE IV—SALES OF MECHANICAL LOADING EQUIPMENT IN 1948 COMPARED WITH TOTAL NUMBER OF MACHINES IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use, as reported by mine operators							Number of machines sold, as reported by manufacturers in 1948
	1941	1942	1943	1944	1945	1946	1947	
Bituminous-coal and lignite mines:								
Mobile loading machines	1985	2301	2525	2737	2950	3200	3569	723
Scrapers	109	93	83	87	87	75	67	17
Pit-car loaders	607	481	321	241	142	93	71	(1)
Conveyors equipped with duckbills or other self-loading heads	788	1062	1226	1331	1383	1521	1531	(2)
Hand-loaded conveyors, number of units	2807	3041	3191	3236	3385	3470	3979	1025
Anthracite mines (Pa.):								
Mobile loading machines	(3)	(3)	5	12	20	27	25	2
Scrapers	[3] 505	[3] 524	510	491	548	564	594	32
Pit-car loaders	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(1)
Conveyors equipped with duckbills or other self-loading heads	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(2)
Hand-loaded conveyors, number of units	[4] 2432	[4] 2491	[4] 2701	[4] 2807	[4] 3006	[4] 3233	[4] 3457	184

[1] Canvass of sales of pit-car loaders discontinued in 1945.
[2] Sales of conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.
[3] Mobile loading machines are included with scrapers.
[4] Pit-car loaders and conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.

TABLE V—COMPARISON OF MECHANICAL LOADING EQUIPMENT AND "MOTHER" CONVEYORS IN ACTUAL USE IN 1947 WITH SALES REPORTED IN 1948, BY STATES

State	Mechanical loading equipment						"Mother" conveyors [2]
	Mobile loaders		Scrapers		Conveyors [1]		
	In use in 1947	Sales in 1948	In use in 1947	Sales in 1948	In use in 1947	Sales in 1948	Sales in 1948
Bituminous-coal and lignite mines:							
Alabama	135	8	31	...	358	66	6
Arizona	...	...	...	...	...	...	1
Arkansas	...	1	...	...	73	18	...
Colorado	28	4	1	...	307	8	...
Idaho	...	...	...	...	...	4	...
Illinois	554	44	...	...	27	6	14
Indiana	142	14	...	...	...	2	...
Iowa	5	...	...	...	12	...	...
Kentucky	351	124	1	1	709	145	41
Maryland	3	...	...	...	35	1	...
Michigan	...	...	...	...	1	...	...
Montana	41	...	...	...	8	1	...
New Mexico	18	3	6	...	1	...	...
North Carolina	...	...	...	1	...	2	...
North Dakota	7	...	...	...	...	...	...
Ohio	179	36	...	...	178	44	5
Oklahoma	4	...	...	...	83	18	5
Pennsylvania	800	169	14	2	1,024	215	25
Tennessee	15	19	...	...	171	20	3
Utah	87	15	...	...	132	6	...
Virginia	98	20	...	...	188	35	4
Washington	1	...	6	2	97	...	...
West Virginia	1,071	265	...	8	1,797	425	124
Wyoming	30	1	8	3	309	9	2
Total bituminous-coal and lignite	3,569	723	67	17	5,510	1,025	230
Pennsylvania anthracite mines	25	2	594	32	[3] 3,457	184	5
Grand total	3,594	725	661	49	...	1,209	235

[1] Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.
[2] Includes all haulage conveyors with capacity over 500 ft except main slope conveyors. Data on number in use in 1947 are not available.
[3] Includes pit-car loaders and duckbills or other self-loading conveyors.

TABLE VI—NUMBER OF MOBILE LOADERS IN USE IN BITUMINOUS-COAL AND LIGNITE MINES, BY TYPES OF LOADING, IN EACH STATE, IN 1946 AND 1947

State	Number of mobile loaders: Loading direct into mine cars		Loading onto conveyors		Loading into rubber-tired trucks		Total number in use	
	1946	1947	1946	1947	1946	1947	1946	1947
Alabama	24	28	58	65	30	42	112	135
Colorado	10	12	1	2	19	14	30	28
Illinois	453	416	28	27	101	111	582	554
Indiana	106	103	...	...	40	39	146	142
Iowa	...	2	4	3	...	...	4	5
Kentucky	156	173	10	14	123	164	289	351
Maryland	...	...	1	...	...	3	1	3
Montana (bit. and lig.)	43	36	...	...	4	5	47	41
New Mexico	12	13	...	...	4	5	16	18
North Dakota (lignite)	6	7	...	...	...	...	6	7
Ohio	117	119	17	20	28	40	162	179
Oklahoma	...	...	4	4	...	...	4	4
Pennsylvania (bituminous)	494	556	43	67	156	177	693	800
Tennessee	4	3	...	...	7	12	11	15
Utah	55	58	11	9	14	20	80	87
Virginia	73	76	3	3	7	19	83	98
Washington	1	1	...	...	...	...	1	1
West Virginia	689	772	27	47	187	252	903	1071
Wyoming	24	22	...	4	6	4	30	30
Total	2267	2397	207	265	726	907	3200	3569

Use of Supplementary Haulage Equipment Increases

"Mother" conveyors—For the purpose of this study, a "mother" conveyor is defined as a sectional, extensible, power-driven conveying unit that can handle over 500 ft of conveyor. Main-slope conveyors are excluded.

The last column in Table V shows the sales of "mother" conveyors, by States, in 1948. West Virginia received the largest number (124), followed by Kentucky (41), Pennsylvania (25), and Illinois (14). The total number of "mother" conveyors shipped in 1948 was 235 in comparison with 204 in 1947. No capacity estimates have been made for these "mother" conveyors, and they are not included in the summaries of mechanical loading equipment.

Trackless gathering equipment—Shipments of shuttle cars or rubber-tired, self-powered haulage units were made to 13 States in 1948. West Virginia received the greatest number or 39 percent of the total number shipped; Kentucky, Pennsylvania, Illinois, and Alabama followed in the order named. During 1947, 28 percent of the total bituminous coal and lignite loaded by mobile loaders was handled by shuttle cars; this compares with 25 percent in 1946. The remainder of the mobile loader tonnage was loaded onto conveyors (four percent) and directly into mine cars (68 percent).

Table VI shows the number of mobile loaders used at bituminous coal and lignite mines, by States and types of loading, in 1946 and 1947. The total number of mobile loaders in use increased from 3200 in 1946 to 3569 in 1947 or 11.5 percent, while the number loading into rubber-tired trucks or shuttle cars increased from 726 to 907 or 24.9 percent. Approximately 2000 shuttle cars were used in bituminous coal and lignite mines in 1947.

Mechanical Cleaning Equipment Sales

Reports from 15 manufacturers of bituminous-coal cleaning equipment show that sales were made in nine States in 1948. The total capacity of sales in 1948 was 17,700 net tons of cleaned coal per hour, as compared with 17,300 net tons capacity sold in 1947.

Table VII shows data on bituminous coal cleaned in 1947, by type of equipment in use and annual capacity of equipment sold in 1948. For comparative purposes the annual capacity of 1948 sales is based on the average number of days (234) bituminous coal mines were active in 1947. However, only a small percentage of the cleaning equipment sold in 1948 was placed in operation during the year; the balance will be installed in 1949 and 1950.

The capacity of all types of equipment sold in 1948 for cleaning coal by wet methods was equivalent to 18.6 percent of the bituminous coal so cleaned in 1947, while the capacity of pneumatic equipment sold in 1948 was 10.4 percent of the tonnage pneumatically cleaned in 1947.

The ratio of 1948 sales of new cleaning plants to additions or replacements of present plants, in terms of capacity, was 40 percent as new plants and 60 percent as additions or replacements.

TABLE VII—BITUMINOUS COAL CLEANED IN 1947 AND CAPACITY OF EQUIPMENT SOLD IN 1948, IN THE UNITED STATES, BY TYPES OF EQUIPMENT [1]

Type of equipment	1947: Number of plants in operation [2]	1947: Net tons of cleaned coal [2]	1947: Percent cleaned by each type	Annual capacity of equipment sold in 1948 [3] (net tons)
Wet methods:				
1. Jigs	234	85,931,353	49.3	(4)
2. Concentrating tables	9	2,980,368	1.7	(4)
3. Classifiers	67	14,647,771	8.4	(4)
4. Launders	19	17,902,394	10.3	(4)
5. Dense-Media	70	17,702,322	10.1	(4)
6. Jigs and concentrating tables	14	4,302,422	2.5	(4)
7. Other combinations of methods 1, 2, 3, and 5	27	12,616,822	7.2	(4)
Total wet methods	440	156,083,452	89.5	29,100,000
Pneumatic methods	84	18,352,485	10.5	1,900,000
Grand total	[5] 524	174,435,937	100.0	31,000,000

[1] A small percentage of the equipment sold in 1948 was placed in operation during the year and the remainder will be placed in operation during 1949 and 1950.
[2] Includes plants operated by consumers at central washeries in Colorado and Pennsylvania.
[3] Based on 234 days (average days mines were active in 1947) and 7.5 hours per day.
[4] Included under "Total wet methods."
[5] Includes a duplication of 63 plants using both wet and pneumatic methods; deducting this duplication gives a net total of 461 plants that cleaned coal in 1947.

—Credit U. S. Steel News

Despite weather conditions, construction work proceeds at the antimony smelter of the Bradley Mining Co., Stibnite, Idaho

Ferroalloys and Other Strategic Metals

By S. H. WILLISTON
Vice-President
Cordero Mining Co.

WITH THE exception of antimony, the domestic strategic metal industry continued to decline almost to the vanishing point in the year 1948. No one outside the industries, whether in Washington or elsewhere, seems to be in the slightest concerned about the domestic production of these key metals of minor total value without which most of our industrial manufacturing facilities would have to cease operations.

Antimony

Antimony, the one bright spot among the strategic metals, is still under allocation. In spite of the fact that supplies were greater than consumption, Washington officialdom is requesting reenactment of allocation powers. They have not asked for allocation over lead and copper which are far more difficult to obtain than antimony.

Estimated imported antimony was slightly over 16,000 tons. Domestic mine production, almost entirely from the Bradley operations at Yellow Pine, Idaho, accounted for an additional 6000 tons, or almost exactly 25 percent. Secondary recovery totaled roughly 21,000 tons, making a total supply of 41,000 tons for the year. Domestic consumption and exports are estimated at 40,000 tons, leaving a surplus of a little over 1000 tons. The fact that stocks declined some 3000 tons during the year would seem to indicate that the government stockpile acquired the differences.

Some 5000 tons of metal, an unexpected arrival in the latter part of the year, made the difference between a comfortable situation and a tight situation. Antimony prices rose during the year to almost an all-time high and uncertainties about the possibility of future imports of antimony from China made the future outlook for antimony operations promising.

The Bradley Mining Co. expects to be in operation with their new Yellow Pine, Idaho, smelter, producing both metal and oxide, during the coming summer.

Quicksilver

The quicksilver cartel, Mercurio Europeo, after becoming "reasonably well satisfied" with the elimination of American competition, abruptly raised the price of quicksilver to $92 New York, duty paid, on December 21. Price competition from abroad, together with the importation of an estimated 43,000 flasks of foreign metal, forced the closure of all domestic quicksilver mines with the exception of Sonoma Quicksilver Mines, Inc. at Guerneville, Calif. Actual production for 1948 will probably be something slightly over 14,000 flasks. The rate of production as the year closed would indicate that not more than 5000 flasks will be produced in 1949. This figure of 5000 flasks is the lowest production rate of quicksilver since the metal was first discovered in California in the days of the gold rush. No mines are contemplating reopening at present prices. It is highly doubtful if any mines would reopen below $125 a flask and $150 would be needed with present costs to get back to prewar levels of production. The present price of $90 to $92 at New York is not as high, considering freight rates, as the average for 1937 and domestic mining costs on all metals are approximately double those of prewar years. Thus the present price of $92 would be the equivalent of $46 a flask in the late thirties.

The continued importation of war surplus mercury from Japan at prices appreciably below the New York market has contributed materially to the over-supply within the United States.

The fact that the European Cartel,

after destroying the domestic industry by quotations as low as $46 fas New York, has now gone so far as to appoint an official agent of the cartel in New York City indicates that they feel they have the Washington situation well in hand.

Tungsten

The tungsten industry in the United States has survived an uncertain year with rising labor, supply, and equipment costs, and falling prices, due to the tariff cut of $1.90 per unit which went into effect on May 22. The cut in the tariff resulted in an even greater price reduction in the metal and foreign material has been offered in fair volume at prices far below the $28.50 delivered price for domestic metal. The situation in China would indicate no improvement in supplies from this quarter and larger military expenditures for 1949 may brighten the situation for domestic producers. Domestic production for 1948 will probably approximate 4000 short tons, 60 per cent WO_3, while consumption was approximately twice that amount.

The Ima mine of the Bradley Mining Co. resumed production after a shutdown of a year while the mill, destroyed by fire in 1947, was being rebuilt. With this reinforcement in productive capacity it is probable that 1949 production will hold at the 1948 rate. There is little possibility of any new tungsten mines opening at present prices and costs.

Manganese

The Anaconda Copper Co. at Butte, Mont., is continuing to supply over 95 percent of the domestic production of metallurgical grade manganese, accounting for some 7 percent of domestic requirements. Manganese imports from foreign countries were insufficient to meet requirements by a margin of almost 20 percent. Imports of manganese have been steadily declining for the last three years from 1,750,000 tons in 1946, to 1,550,000 tons in 1947, and to an estimated 1,200,000 tons in 1948. Consumption, on the other hand, has been steadily increasing from 1,135,000 tons in 1946, to 1,400,000 tons in 1947, and to 1,460,000 tons in 1948. Consumption has passed imports plus the small domestic production and the steel industry has been forced to draw on meager stocks in this country. In 1948, approximately 33 percent of our imports came from Russia, 47 percent from other transoceanic sources, mainly Union of South Africa, India and the Gold Coast, and only 20 percent originated in the Western Hemisphere.

In the early part of the year there were rumors that Russia had threatened to curtail drastically her exports of manganese and as the year came to a close, this threat was repeated with some considerable curtailment in imports from that source. Considering the fact that for 1948 imports were below requirements, any further serious curtailment of imports would make the manganese situation in this country a serious one.

In the meantime, metallurgical grade manganese production from sources other than Butte is continuing to decline with little possiblity of change under present price cost relationship.

The U. S. Vanadium Corp. at Bishop, Calif., is an important tungsten producer

Chrome

The last producer of metallurgical grade chrome in the United States shut down in the late summer. Advancing costs made it impossible to remain in operation. With the exception of the imports from Cuba of 1 percent of our metallurgical grade and 30 percent of our refractory grade, or roughly 10 percent of our total imports, all remaining chrome supplies for American industry come from transoceanic sources. Russia, during the last year, supplied about 9 percent of our chemical grade material, 42 percent of the metallurgical grade, and no refractory grade, but the total imports from Russia were approximately 35 percent of total material received in this country. The remaining 55 percent of imported chrome came from the Union of South Africa, Turkey, the Philippines, and Southern Rhodesia. Total imports during the year were probably close to 1,500,000 tons, while consumption, though higher than any year since 1945, was only some 850,000 tons.

Like manganese, during the early part of the year, there were some rumors that Russia would cut off chrome exported to the United States, and further, definite statements to that effect were made at the close

of the year. Since imports were 40 percent in excess of requirements and 35 percent of the imports came from Russia, a cessation of importation of Russian chrome would bring imports and consumption in rather close balance. The fact that all metallurgical grade material must come from considerable distances adds difficulty to the problem of increasing supplies from sources other than those now shipping.

It is interesting to note both as regards chrome and manganese ore received from Russia that neither is particularly suitable for stockpiling purposes. In the meantime, interest in domestic chrome deposits is entirely lacking. DPC plants erected during the war have been stripped or otherwise disposed of and from a domestic point of view, the chrome situation is about as it was in 1939.

On all of these five strategic metals with the exception of antimony, we have become almost entirely dependent on foreign sources. Domestic production of chrome and manganese has been abandoned apparently with government approval and we are now dependent upon Russia for the maintenance of our domestic steel industry.

Insofar as quicksilver is concerned, we are almost entirely dependent upon Italy and Spain. For tungsten we are largely dependent upon China, Asia, and South America. The future for the domestic production of any of these metals under present policies and conditions is far from bright.

* * *

Combined output of all ferroalloys during 1948 was approximately 2,000,000 net tons valued at $300,000,000. There was a heavy demand for ferroalloys by a steel industry which hung up a record production estimated at 88,000,000 net tons.

Nickel

Following the general upward trend of metal prices, in July 1948, electrolytic nickel, fob Port Colburne, Ontario, rose from 33¾c per lb to 40c per lb including 1¼c per lb duty. As was to be expected after the cessation of operations at Nicaro in Cuba, imports from Canada during 1948 rose above the 1947 rate. Canadian nickel production for the first nine months of 1948 was 95,105 short tons as compared to 85,704 tons in the same months of 1947.

A total of 122,317,139 lb of combined metallic nickel, matte, and oxide were imported by the United States through October 1948. Although the bulk (115,942,926 lb of metal and all the matte and oxide) came from Canada; Norway supplied nearly 5,000,000 lb and smaller amounts were imported from Great Britain, Russia, Union of South Africa, Italy and the Netherlands.

Cobalt

Stockpile and consumer use increased cobalt demand during 1948, but domestic production dropped three percent and imports fell 19 percent. Despite the increased need, the price held to $1.65 per lb for 97-99 percent metal in 550-lb kegs delivered east of Chicago.

Consumer needs were met by drawing on existing stocks which were reduced by 62 percent in 1948. For the first three quarters industrial consumption totaled 3,630,000 lb, or more than 500,000 lb more than in the same period of 1947.

Cobalt for permanent-magnet alloys represented the greatest industrial use of the metal in 1948, consuming 24 percent of the total. Large amounts were used to make cast cobalt-chromium-tungsten alloys. Increased activity in the steel industry raised its demand for use in the manufacture of special steels. Increasing usage of tungsten-carbide cutting tools for rock drill bits and other uses raised the amounts of cobalt used by this important segment of the industry as a binder in the fabrication of cemented carbides.

By-product cobalt from the Cornwall, Pa., mine of the Bethlehem Steel Co. was the only domestic source of commercial cobalt ore in 1948. Development of the Calera cobalt deposit in Lemhi County, Idaho, by Howe Sound Co. is being watched with deep interest as it may be expected to add to future domestic production.

Cobalt imports, principally from the Belgian Congo, Belgium, and Canada, consisting of alloy, metallic cobalt, and salts and other compounds, contained nearly 6,500,000 lb of metallic cobalt. Except for 13 percent, the imports from Canada were from stocks belonging to the U. S. Government stored at Delor, Ontario.

Molybdenum

In the first nine months of 1948 production of molybdenum compounds and ferroalloys exceeded the 1947 output by 18 percent, although in the same period consumption rose only nine percent. Largely responsible for the increased activity was the steel industry, which normally uses about 70 percent of the total United States consumption. Exports during the same period exceeded those of 1947.

Utah maintained its position as the leading domestic producer of molybdenum with Colorado a close second. Unlike Climax where mine production is keyed to meet the demand, the Kennecott Copper Corp. production of molybdenum is as a by-product of the copper mined in Bingham Canyon.

Concentrate produced in the first three-quarters of 1948 totaled 22,074,200 lb or approximately six percent more than in the same nine months of 1947. In addition to the principal producers molybdenum concentrates were also produced in New Mexico, California, Arizona, and Nevada. Production in Utah ceased with the strike at Bingham, Utah, which completely shut down all operations. Despite this loss of available concentrates, it is most likely that mine operations in the several producing states will result in an exportable surplus in 1949.

Throughout 1948 the price of concentrates, minimum MoS_2, 90 percent, held to the 45-cent figure effective since 1938. On December 31, 1948 the price was raised to 54c.

Titanium

For many years interest in the unusual properties of titanium has spurred search in the production and application of this strong, lightweight, corrosion-resistant metal. Both the U. S. Bureau of Mines and private industry have been active in developing methods of production and prospects for large-scale production are brighter now than ever before. Discovery was announced of a large deposit of ilmenite in Quebec, by the Kennecott Copper Corp. and the New Jersey Zinc Co., along with the intention to exploit the property. E. I. du Pont de Nemours & Co. announced its intentions to produce titanium.

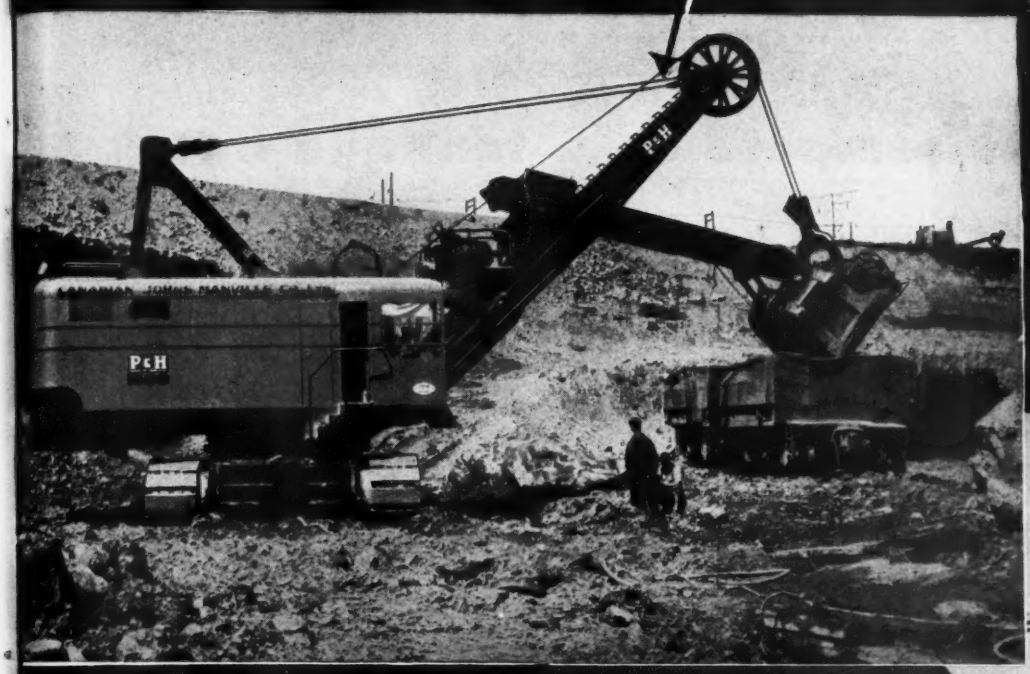
Domestic production of ilmenite was raised to the all-time high of 372,000 short tons to meet the strong demand of the paint and pigment industry. The MacIntyre Division of the National Lead Co. at Tahawus, N. Y., maintained its position as the world's largest ilmenite producer. Additional production came from the Rutile Mining Co. and the Riz Mineral Co., Fla., Yadkin Mica and Ilmenite Co., N. C.; American Rutile Corp. and American Cyanamid Co., Va.; and the Live Oakes Mines and the Ferro-Titan Mineral Co., Calif. At Starke, Fla., the du Pont property is expected to get into production in the spring of 1949. Ilmenite imports through October 1948, coming from India, Brazil, Norway, British Malaya, and Canada, were 228,000 tons.

Rutile production in 1948 fell to 7100 tons, but imports rose to twice the 1947 rate. Nearly all of the 8100 tons brought into the United States originated in Australia.

Vanadium

Activity in the field of mining vanadium ores was increased largely because of the vital importance of their uranium content. Vanadium has been converted to the status of a by-product and it is possible that surpluses could develop.

From EAST *to* WEST



Dozens of users of P&H Electric Shovels have found the P&H Magnetorque Drive an outstanding advantage. It transmits power for hoisting by electro-magnetic forces rather than by mechanical contact. It results in steadier, faster production—fewer interruptions. And it cuts maintenance costs to the bone. Many users state that they would select P&H Electric Shovels on the strength of this feature alone. Yet Magnetorque is only one of many sound reasons why experienced users re-order P&H Electric Shovels.

P&H HARNISCHFEGER

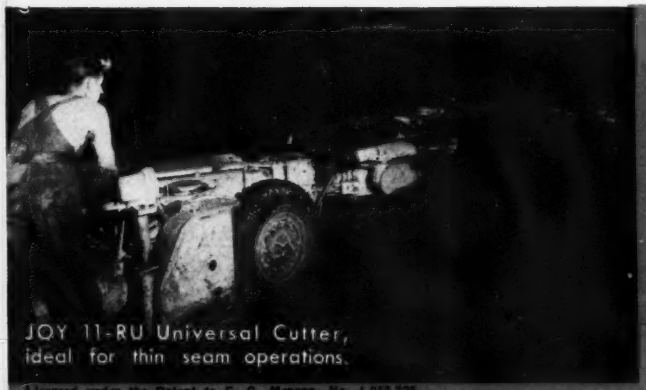
ELECTRIC SHOVELS
4555 West National Avenue
Milwaukee 14, Wisconsin

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS | P&H | HOISTS • WELDING ELECTRODES • MOTORS

LEADING THE FIELD IN ELECTRIC SHOVEL DEVELOPMENT

JOY pioneered mechanization in the coal mines of America . . .

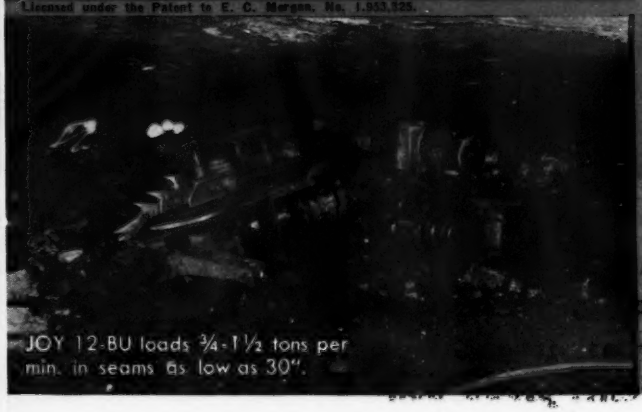
Today, to compete on a tonnage basis, JOY Cutters, Loaders, Shuttle Cars and Conveyors are doubly essential.



JOY 11-RU Universal Cutter, ideal for thin seam operations.

JOY 8-BU Loader, medium height, capacity 1½-3 tons per min.

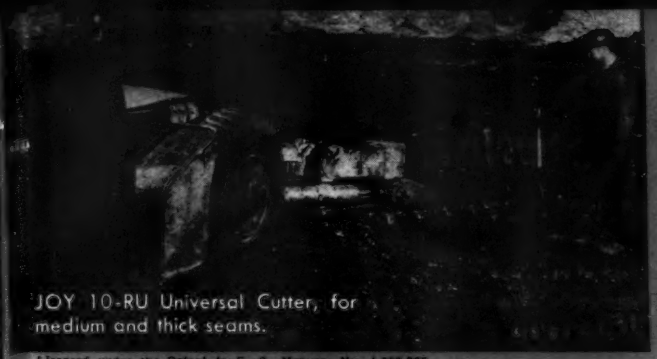
Licensed under the Patent to E. C. Morgan, No. 1,953,525.



JOY 12-BU loads ¾-1½ tons per min. in seams as low as 30".

A loaded JOY 42" Shuttle Car heading for a transfer station.

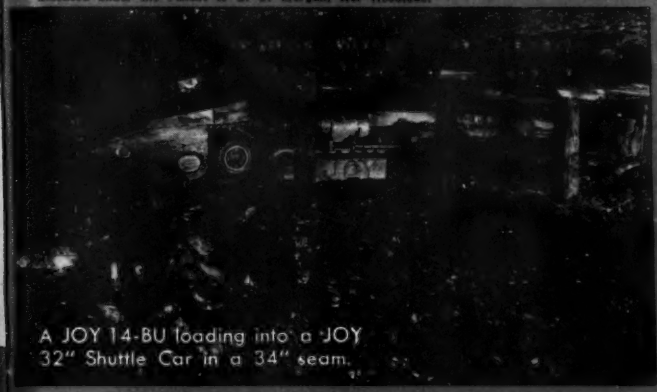
In high coal and low coal, in mines in every section of the country—JOY Mechanized Mining Equipment is outstandingly successful in speeding up rates of production and lowering tonnage costs.



JOY 10-RU Universal Cutter, for medium and thick seams.

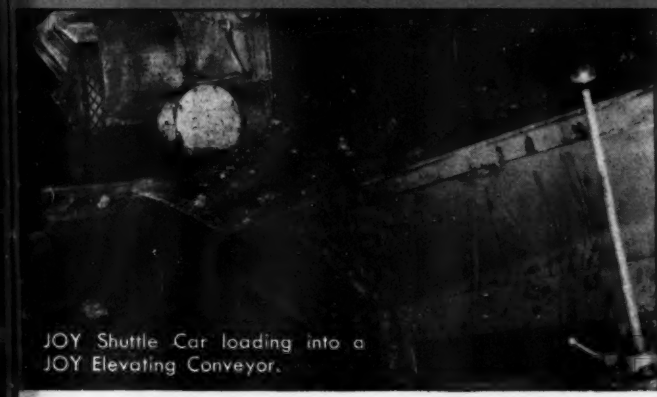
6-SC Shuttle Car with elevating discharge, and JOY Belt Conveyor.

Licensed under the Patent to E. C. Morgan, No. 1,933,325.



A JOY 14-BU loading into a JOY 32" Shuttle Car in a 34" seam.

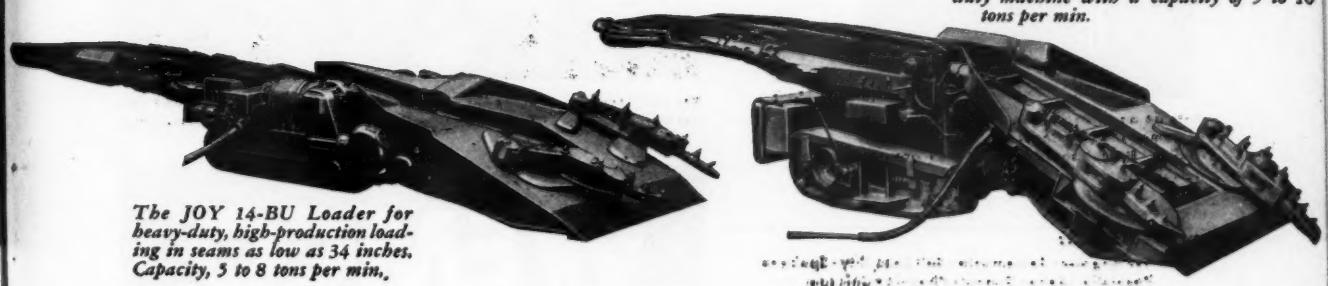
JOY J1-B Shortwall Cutter with Bugduster, for conveyor mining.



JOY Shuttle Car loading into a JOY Elevating Conveyor.

A JOY 36" Slope Belt Conveyor with sealed-for-life bearings.

The JOY 11-BU Loader, designed for maximum production in seams 60" or more—a heavy-duty machine with a capacity of 5 to 10 tons per min.



The JOY 14-BU Loader for heavy-duty, high-production loading in seams as low as 34 inches. Capacity, 5 to 8 tons per min.

Consult a Joy Engineer

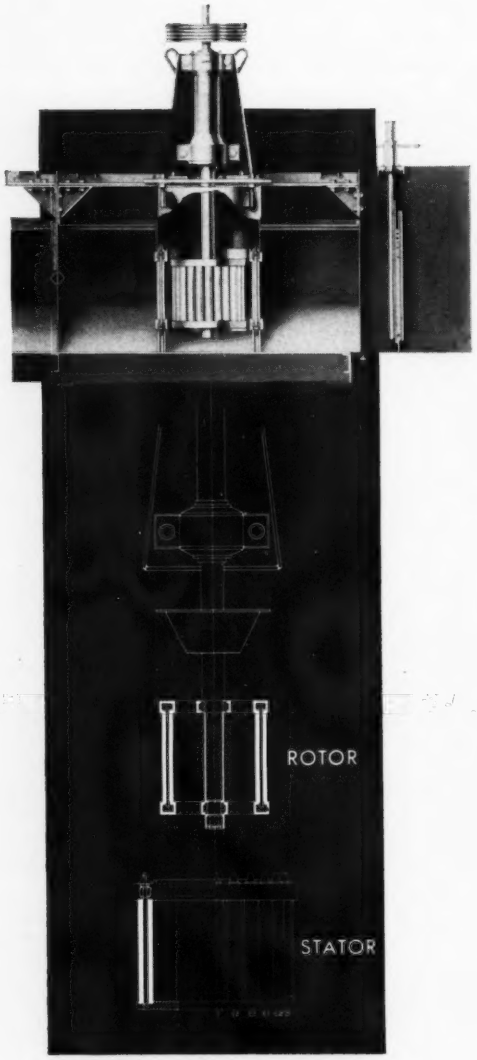
WAD CL 2070

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

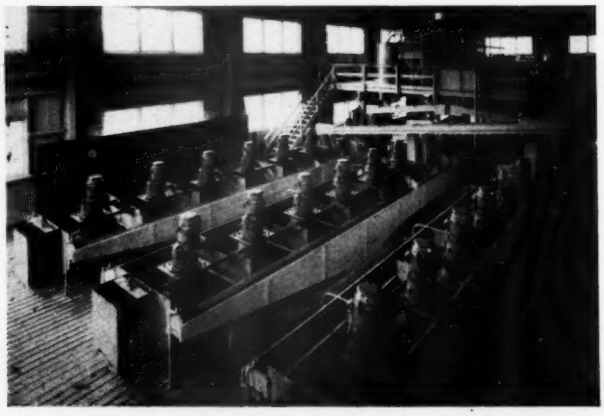
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

NOW! The FAGERGREN *Flotation Machine* is another WEMCO product



Intense aeration and agitation of pulp are accomplished by the unique Rotor-Stator design. Higher speed of float and greater metallurgical capacity result.

- Acquisition of exclusive manufacturing and sales rights to the famous Fagergren Flotation Machine marks another forward step in WEMCO progress.
- To the mineral engineering industry, this combination of superior design and proven engineering experience assures the aggressive development and improvement of flotation methods.
- The adaptability and high efficiency of the Fagergren Flotation Machine combined with the practical engineering competence of the WEMCO organization are guarantees of superior results in the treatment of both metallic and non-metallic minerals. The WEMCO staff includes flotation experts of outstanding reputation in the industry.
- Prompt service to present and prospective operators of Fagergren Flotation machines is available from WEMCO field engineers throughout the United States and in many foreign countries.
- Complete warehouse inventories of replacement parts at major WEMCO offices already have been established. Inquiries and requests for servicing should be directed to one of the WEMCO offices or agents listed below.



The unit, level design of the Fagergren installation in the mill of Bagdad Copper Corporation provides flexibility in flow scheme and simplicity of installation.

PRINCIPAL OFFICES

Los Angeles • Sacramento • Salt Lake City • Spokane
Pocatello, Idaho • Denver • Phoenix • Chicago
Hibbing, Minnesota • Bartow, Florida • New York

EXPORT DISTRIBUTORS

The Ore and Chemical Corporation
80 Broad Street • New York 4, N. Y.

Continental Europe and North Africa

Dr. Ing. Herbert Lickfett A/B, Stockholm 3, Sweden
Milieu Dense, Paris, France
Ferdinand Egeberg & Company, Oslo, Norway
Midac, Milan, Italy
A. Schuburth & Company, Basle, Switzerland
G. Maltsiniotis & Co., Athens, Greece
Agence Miniere & Maritime, S. A., Antwerp, Belgium
Adil Gabay & Albert Koenka, Istanbul, Turkey

WEMCO

WESTERN MACHINERY COMPANY

760-766 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA

WKE (HMS) Mobil-Mill • Coal Spiral • Standard Thickeners (HMS) Thickeners • (HMS) Media Pumps • Hydroseparators (HMS) Densifiers • (HMS) Separatory Cones • "SH" Classifiers Sand Pumps • Conditioner and Agitators • Fagergren Floatation Machines • Dewatering Spirals • (HMS) Laboratory Units

Conveyor slopes are utilized in many new mines

Trends in Bituminous Coal Mining Practices

Underground Methods Incorporate More Mechanical Equipment

★

By DAVID INGLE, JR.

President
Ingle Coal Corp.

★

MECHANICAL COAL mining has been an accomplished fact for some years; locomotive haulage, machine undercutting, and electric drills have long been accepted practices, while more recently, loading machines, rubber-tired haulage and conveyors have come into use. During and since the war, the trend has been toward improving the existing types and developing auxiliary aids for their increased efficiency.

In coal mining, the machines must go where the work is and the necessity for leaving coal pillars to support the roof between working places makes it impossible for anyone to oversee the entire operation, from one spot, or even several locations. This complicates supervision and means that rapid and effective communication is a necessity in mechanized mining. For this purpose, the telephone has proven invaluable and in recent years, radio communication, or "wired wireless" has added inestimably to the improved operations made possible by better communications. The haulage supervisor or dispatcher is in constant contact with the motorman and can keep a mental picture of the haulage operation; superintendents, foremen and maintenance men have only to go to the nearest telephone or radio-equipped locomotive to learn the situation in other parts of the mine. Thus, bottlenecks can be eliminated almost before they develop.

Haulage Improvements

The newer locomotives are faster and heavier; the cars are larger. In medium high coal for both track and tractor loaders, mine car capacities run from six to ten tons and more. Some of the newer drop-bottom cars have a dust-proof door design that eliminates dribbling fine coal onto the road. Automatic couplers have been installed on some cars, particularly where track-mounted machinery is used to load coal directly into the cars. The use of prefabricated track is cutting costs in some all-track haulage mines.

In many of the newer mines, belt conveyors are used for gathering haulage and some use belt conveyors all the way to the tipple. Where belt conveyor haulage is used after crawler-mounted loading machines, the trend is toward the use of rubber-tired shuttle cars instead of chain conveyors between the loaders and the panel belts. A few mines have been unable to make use of belt conveyors because the coal breaks into lumps too large for handling on conveyors of reasonable width. Improved belt design making use of steel or nylon cords has permitted much longer distances between centers, thus reducing the number of transfer points required and simplifying the installation of cross-entry and main haulage belts. The large amounts of supplies needed in mining require some auxiliary transportation where belts are the sole means of hauling coal. Many mines use track haulage for supplies and man trips. Since the track is there for men and supplies, it might as well haul coal; so a number of newly-projected mines are using, or are planning to use, large capacity cars on track for main-line haulage, with belt conveyors in panel, and in some mines in cross entries. The trend appears definitely toward the use of belts in panels wherever it is possible. Several new mines using conveyor haulage all the way use no track at all. They use rubber-tired equipment for hauling men and supplies.

Slopes Tend to Replace Shafts

The convenience and economy of belt conveyors for hoisting in slopes has long been recognized; so that most of the newer mines where coal is within 200 ft of the surface have such installations. The recent development of steel cord or cable belts which can stand higher tensile stresses has made much deeper coal available for hoisting via belt conveyors. Although

slope conveyor installations in the past seldom ran over 700 or 800 ft between centers, a projected installation in Illinois calls for a 42-in. belt conveyor on a 16 deg slope having a center to center length of 3300 ft. This belt will deliver coal from a bin below the coal seam to a surface bin at the rate of 1000 tons per hour, and will be driven by a 1500 hp motor. Vertical depth to the coal at this mine is 792 ft.

Twin 7 by 12-ft slopes on 40-ft centers are now being driven at this mine. Crosscuts are driven every 250 ft. These slopes will be about 2850 ft in length when the coal seam is reached. The driving of two slopes greatly aids ventilation during sinking; but the primary reason for two is to provide sufficient airway space for the large volume of air that will be required to ventilate the mine.

The management of this mine has concluded that it will cost less to sink these long slopes than it would to sink a shaft large enough to hoist 1000 tons per hour. In addition to the pair of slopes there will be two 16-ft diameter circular shafts for men and air. The man shaft, as in many other deep mines, will be equipped with a fully automatic elevator.

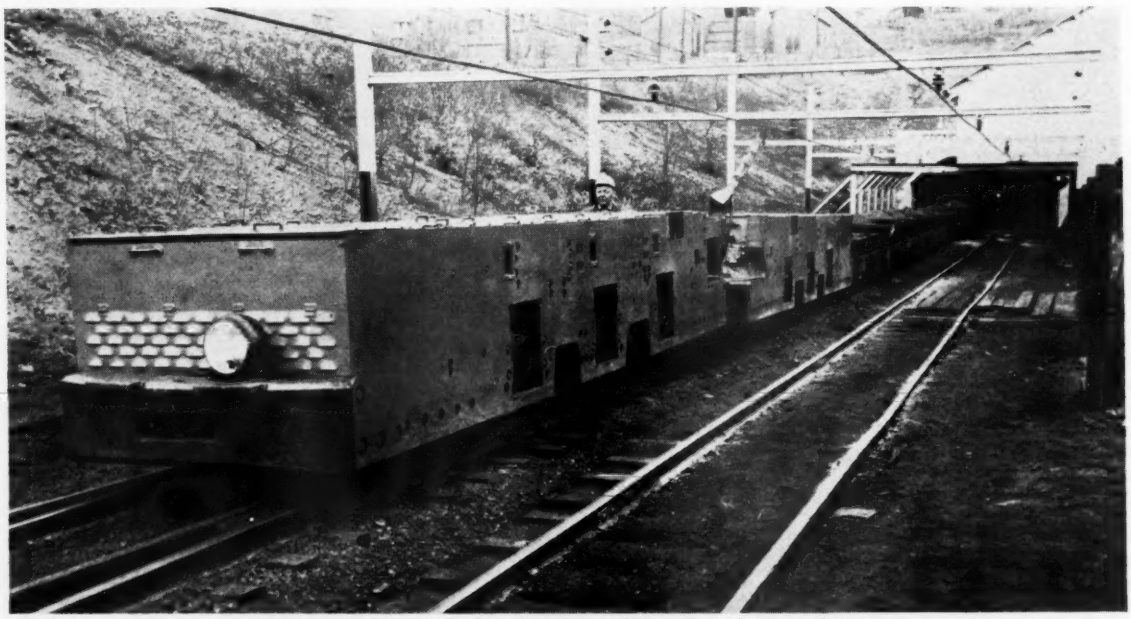
Although it has been the custom to use mechanical loading machines in slope sinking, this operation is unusual in that McKinlay entry drivers are being employed successfully in both slopes. These machines, which had been designed for driving entries through solid coal without prior preparation or blasting, have successfully advanced through the shale, soapstones, etc., encountered in the slopes, although, quite naturally, progress is much slower than it would be in coal. Maximum advance in the slope has been 45 ft in each slope in one day of two eight-hour shifts. The average is somewhat less. These machines have been unable to cut through limestone, some sandstones, and a few other hard formations. The slopes were driven through these hard bands by drilling and blasting in the usual manner, and the use of the entry drivers was resumed as soon as normal strata were reached. Use of the entry drivers results in a smooth opening in which a minimum of roof support is required.

Skip Hoists Show Advantages

Most of the newer mines are using slope belt conveyors for hoisting, but two Indiana mines have chosen instead to use fully automatic skip hoisting from vertical shafts. One of these, the New Snow Hill Mine of Snow Hill Coal Corp. at Terre Haute, Ind., hoists from two veins; one at a depth of 510 ft, and the other down 320 ft. The skip is loaded with 12 tons of coal from weigh pans which in turn have been loaded by plate feeders. The weigh pans will not discharge into the skip until they contain the exact predetermined weight of coal. This exact loading is essential in order to properly adjust the automatic hoisting controls. With too light a load the skip would go into the dump too fast. If the load were too great, it could fail to dump. Fully automatic control of high capacity, high speed hoisting presented a problem in engineering; but its solution marks another step in the progress of mechanized mining. It brings to shaft hoisting the advantages of labor saving heretofore enjoyed only by conveyors in slopes. The decision as to whether to open by shaft or slope still must be made by each operator for each mine after careful engineering study of the factors involved.

Auxiliary Operations Mechanized

Several mechanical timbering machines have been developed to reduce the cost of placing roof support. These machines consist essentially of a lifting device for raising and holding crossbars while legs or other supports are placed beneath them. They are equipped with a power cutoff saw. They are self-propelled by electric motors powered by battery or cable reel, and can haul their own timber supply. Some haul timber supply trailers. The use of timbering machines has resulted in halving the timbering cost in several mines. Mechanical post pullers consisting of two speed hoists mounted on caterpillars increase the safety and reduce the cost of timber recovery. These can be equipped with bulldozer blades for clean up work and repairing roadways. Track or rubber-tired mounted drilling machines are replacing post-mounted drills in a number of mines. There appears to be a trend toward replacing motor generator sets with mercury-arc rectifiers for power conversions because of their greater efficiency and mobility. So many different machines are in use in the working sections of modern mines that the section foreman needs to double as a traffic cop.



A 50-ton tandem unit hauls against the grade in a Pennsylvania coal mine

Active Development of Continuous Mining Machines

The introduction of continuous mining machines which win coal directly from the solid face without prior cutting, drilling, or shooting promises to alleviate the traffic congestion, as the one machine combines the operations of the cutting machine, drill, and the loading machine. Because the elimination of blasting results in less disturbance to the roof strata, the continuous mining machines should reduce the timbering required. Two such machines have been publicly demonstrated in recent months, the Sunnyhill Colmol, and the Joy Continuous Miner, and detailed descriptions of these machines were published in the December 1948 and January 1949 issues of the MINING CONGRESS JOURNAL.

It is of interest to note that they are by no means the first machines to mine coal from the solid. The McKinlay Entry Driver, first introduced some 20 years ago, has been mining and loading coal without prior cutting, drilling or shooting during all these years. Two McKinlay machines in the Orient Number 2 mine of The Chicago, Wilmington and Franklin Coal Co. have driven many miles of 7 by 12-ft entry in the past 20 years. Curved as well as straight headings have been driven with the McKinlay although it is not in the present design adapted to turning crosscuts or rooms.

It does produce some coarse coal in sizes up to 14 in. maximum dimension. The coal produced is firm and does not show much degradation in handling. Headings driven by this machine are of an oval cross section formed by two intersecting circles connected by tangents at the top and bottom.

Radio dispatching provides close control

There are two problems yet to be cleared up in the use of the continuous miners; one is the coal size. They do not produce as large lumps as does conventional mining. This is in part offset by the firmer structure of the coal which has not been shattered by blasting; and by the fact that they produce a smaller percentage of extreme fines. As mentioned previously, the McKinlay does make some coal in egg and small lump sizes; but it is the least flexible of the three machines. All of the continuous mining machines produce considerable dust; enough, to be a serious problem. This problem must be whipped, preferably without using water; and the manufacturers are striving hard to develop a satisfactory method of dust control. The development of tungsten-carbide bits has done much toward making continuous mining practicable.

All three of the machines mentioned can produce coal at rates that compare favorably with those of the conventional types of equipment. They will simplify mining operations by permitting a much higher degree of concentration of operation. They are safer to operate because the operator is positioned 14 or more feet from the working surface. Since roof and rib are not subjected to the shattering action of explosives it should be possible to leave thinner pillars, thus getting a higher percentage of extraction in mines where pillars are not taken. In pillar mining the greater speed of development also should provide greater safety.

Gold Policy Needs Realistic Revision

(*Continued from page* 62)

80 between 1934 when gold was revalued at $35 a fine ounce and the beginning of World War II, and an assumed 160 for the next year or two, $70 an ounce would be required. These analogies are not conclusive, however, since few people are interested in raising the buying power of gold-mine operators.

Supplies of new gold, for whatever use, are ultimately limited by the cost of production. The present price of $35 brings out world gold production of only about two-thirds that of 1940 and leaves unsatisfied the demand of individuals. A price of $50 would undoubtedly result in output sufficient for industrial uses and for use as a personal store of value, as well as for necessary additions to monetary stocks.

All of these comparisons and conjectures are vague. Under present circumstances, an unrestricted gold market might value gold at between $45 and $50 a fine ounce.

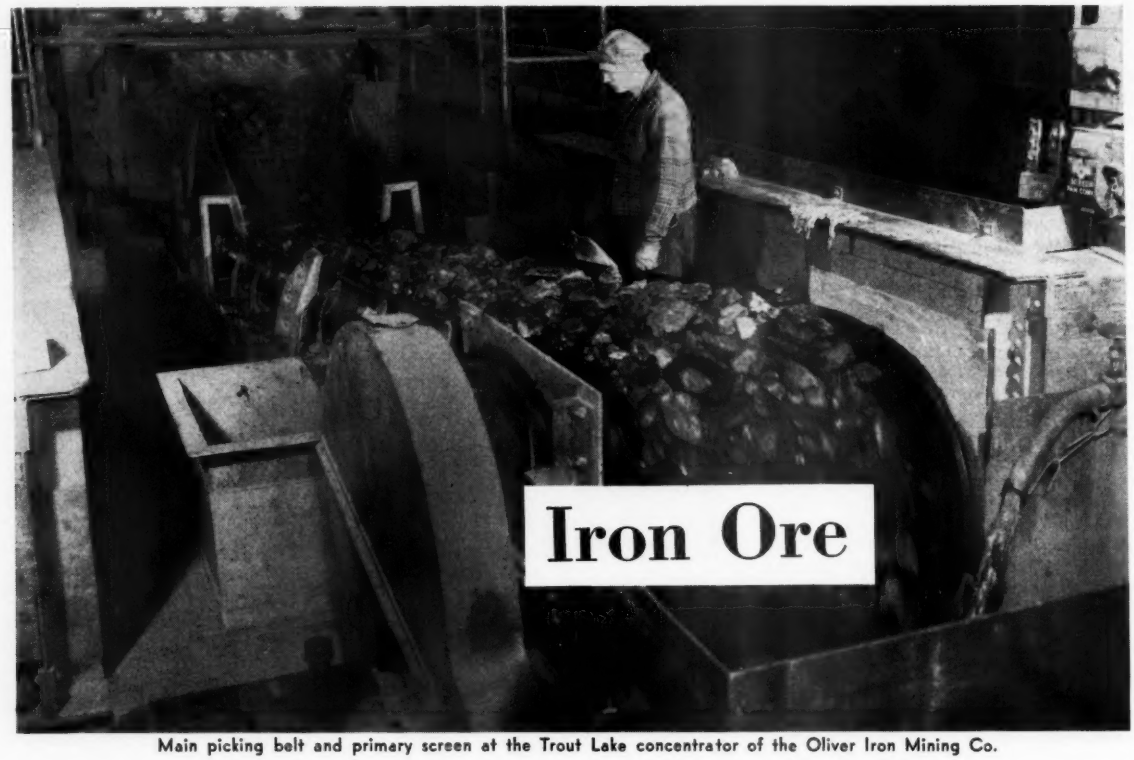
The Future Role of Gold

Our money and credit system has been changing for many decades. There have been cycles of soft money and cycles of hard money. Soft currency has been the standard many times and in many countries. The Bank of England suspended specie payments 24 years (1797-1821) at the end of the Napoleonic wars. The United States did not redeem its notes for several years during and after the Civil War. Every major war has introduced fundamental changes, tending chiefly toward economy in the use of gold. The International Monetary Fund provides great economies in its use as a settler of international balances. This trend probably will continue. But our need for monetary gold constantly increases with growth in population, in productivity, and in wealth.

As long as there are wars between nations, gold will have an important place as a store of value. Major wars always wreck banking and money systems which in times of peace represent an economy in the use of gold.

As one social scientist observed:

"The controversy over hard versus soft money, though ages old, is not yet resolved. Is hard money hard thinking or just rigor mortis of the economy; is soft money soft thinking, or the economic afflatus divinus? Or must we painstakingly inquire after and follow the middle way?"



Iron Ore

Main picking belt and primary screen at the Trout Lake concentrator of the Oliver Iron Mining Co.

1948 Shipments at Peace-Time High—Strong Demand Anticipated in 1949

By M. D. HARBAUGH
Vice-President
Lake Superior Iron Ore Association

WITH TOTAL shipments of Lake Superior iron ore of approximately 84,687,000 gross tons, the year 1948 marks a peace-time record which was exceeded in only two war years, 1942 and 1943. Tonnage loaded by lake was 82,937,192 gross tons, and the all-rail movement amounted to approximately 1,750,000 tons additional—mostly to the furnaces at Duluth and Granite City, Ill.

Table I shows the comparable shipments of Lake Superior ore for each of the past five years. The excess of 5,000,000 tons in 1948 over the 1947 movement was made possible by the combination of extremely favorable weather on the Lakes, efficient operations, and increased aid from Canadian carriers. The latter vessels carried a record volume of over 5,761,000 gross tons, compared to 4,491,000 tons in 1947; and of this, 1,936,000 tons was between United States ports as compared to 473,000 tons in the prior year.

Total United States and Canadian consumption of Lake Superior ore for the year was approximately 80,500,000 gross tons, slightly less than that in 1947, whereas substantially greater consumption had been anticipated early in 1948. A coal strike again was the unwarranted and costly national luxury which prevented production of as much iron and steel as could have been produced, and thus reduced the anticipated consumption of ore. It is obvious that the millions of tons of steel production which have been lost because of strikes in the past few years would have gone a long way toward relieving the persistent shortages which have plagued many consuming industries. There seems little point in all the political pressure for further vast expansion in steel capacity—over and above the substantial increases which the industry has been making continuously—when the whim of one individual can paralyze much of the existing capacity.

Table I also shows the Lake Superior consumption figures for the past five years, together with stocks available to furnaces on significant dates. Even allowing for some increase in consumption above that of the past three months, it is evident that stocks on hand at furnaces and Lake Erie docks on April 1, 1949—the approximate beginning of Lake shipping—will be adequate, to about 18,000,000 tons.

The present outlook indicates continued high demand for iron and steel throughout most of 1949, at least; hence, barring unforeseen interruptions, there is to be no let-up in the ore movement. The consumption of 7,400,000 gross tons last October indicated a potential annual rate of about 87,000,000 tons, and there is some new furnace capacity which has been brought in since then. However, some furnaces are always down for relining or other repairs, so that one cannot assume that theoretical total capacity indicates how much will be consumed at the maximum rate of possible operations in a given 12-month period. Pig iron production in the United States in 1948 is estimated at over 60,900,000 net tons compared to 60,117,000 tons produced in 1947; and preliminary figures on production of steel ingots and steel for castings are

88,509,000 net tons, compared to 84,894,000 tons produced in 1947.

More Ore Needed in 1949

On the basis of recent announcements that United States production of steel in 1949 is expected to be about 92,000,000 net tons, or 3,500,000 above the 1948 tonnage, about 3,000,000 gross tons additional requirement of Lake Superior ore is indicated for United States furnaces, or roughly 81,000,000 tons. Adding the Canadian requirement of nearly 3,000,000 tons, brings the total to 84,000,000 tons which, in terms of upper-Lake railroad weights, means a total movement of about 85,000,000 tons.

Somewhat alleviating the pressure on blast furnaces for iron for steelmaking, is the much easier scrap situation which suddenly developed in December.

With stockpiles of ore at furnaces and Lake Erie docks on April 1, 1949, at a figure which doubtless could stand reduction by a few million tons if need be by April 1, 1950 (note the May 1, 1947, tonnage of 13,555,000), the problem of ore supply for the 12-month period beginning with the opening of the 1949 shipping season is that of attempting again to move as much ore as was moved last year. Clearly, the Canadian vessels will be needed for as much as or more than they handled in 1948, and good weather and good luck will be needed in abundance. The deficiency of rainfall in the Upper Lakes region has been such that lower Lake levels are to be expected, whereas for some years past the Lakes have been at unusually high stages which permitted heavier loading of vessels than may be possible in 1949.

There are as yet no more ore carriers in the fleet, and a 20,000-ton vessel now being built—for Inland Steel—will not be ready until 1951.

The iron-ore industry and the Lake carriers thought they had done a good job in moving 78,000,000 tons by Lake in 1947; they have done a tremendous job in moving 5,000,000 tons more in 1948. It would be unprecedented for this industry to fail to keep the furnaces dependent on it supplied with ore; hence, there is every reason to be

TABLE I—TOTAL LAKE SUPERIOR IRON ORE SHIPMENTS, CONSUMPTION, AND STOCKS ON SIGNIFICANT DATES
IN GROSS TONS—THOUSANDS

	1944	1945	1946	1947	1948
SHIPMENTS:					
By lake—					
From U.S. Lake ports	80,691†	75,110‡	58,079	76,267	81,746
From Canadian ports	479	605	1,278	1,631	1,191
Total by lake	81,170	75,715	59,357	77,898	82,937
All-rail—					
From U.S. mines	1,183	1,209	1,492	1,723	1,742*
From Canadian mines	.....	57	164	83	8*
Total all-rail	1,183	1,266	1,656	1,806	1,750*
TOTAL SHIPMENTS—Lake and rail	82,353	76,981	61,013	79,685	84,687*
CONSUMPTION:					
By U.S. furnaces	84,734	72,200	60,291	77,978	77,761
By Canadian furnaces	2,513	2,376	1,802	2,829	2,843
TOTAL CONSUMPTION—U.S. and Canada	87,247	74,576	62,093	80,807	80,604
STOCKS ON HAND U.S. and Canadian At furnaces and Lake Erie docks—					
On May 1	17,892	16,429	23,079	13,555	17,125
On December 31	37,824	39,059	37,465	36,095	39,460

Source: The Lake Superior Iron Ore Association.
* Partially estimated.
† Includes 16,411 tons Canadian ore loaded at Superior, Wis.
‡ Includes 352,033 tons Canadian ore loaded at Superior, Wis.

TABLE II—SHOWING IRON ORE* SHIPMENTS BY PRODUCING DISTRICTS OF THE UNITED STATES, AND IMPORTS AND EXPORTS

	1944		1945		1946		1947		1948†	
District	Gross Tons Millions	Percent of Total	Gross Tons Millions	Percent of Total	Gross Tons Millions	Percent of Total	Gross Tons Millions	Percent of Total	Gross Tons Millions	Percent of Total
LAKE SUPERIOR Minnesota, Michigan, and Wisconsin	81.86	85.52	75.96	85.35	59.67	84.40	77.98	83.26	83.5	82.7
SOUTHERN—Mainly Alabama, Georgia, Missouri, and Texas	7.40	7.73	6.66	7.48	6.60	9.34	8.23	8.79	8.9	8.8
EASTERN New York, Pennsylvania, and New Jersey	3.50	3.66	3.62	4.07	2.25	3.18	3.77	4.02	4.5	4.4
WESTERN—Mainly Wyoming, Utah, California and New Mexico	2.96	3.09	2.76	3.10	2.18	3.08	3.68	3.93	4.1	4.1
TOTAL	95.72	100.00	89.00	100.00	70.70	100.00	93.66	100.00	101.0	100.0
IMPORTS	0.46		1.19		2.82		4.9		5.4	
EXPORTS	2.16		2.06		1.51		2.8		2.5	

Sources: U.S. Bureau of Mines, Lake Superior Iron Ore Association, and others.
* Exclusive of "by-product" pyrite cinder and sinter from various sources.
† Preliminary.

assured that the necessary tonnage will be made available in 1949.

Table II shows for the past five years the total shipments of iron ore by all the regional districts of the United States, together with imports and exports. Total United States mine shipments in 1948 are estimated at 101,000,000 gross tons, which has been exceeded in only one war year, 1942, when 106,800,000 tons were shipped and when the Lake Superior states alone shipped over 93,000,000 tons. It will be noted from this table that, with the gradually rising output of all the other districts, the percentage of total from the Lake Superior district has gradually declined from near 86 percent to less than 83 percent of the total. Furthermore, with substantial increases in imports in recent years, to about 5,400,000 tons in 1948, the result is a still smaller proportion of Lake Superior ore consumed in relation to total United States ore consumption.

Imports Become More Important

Imports from Canada in 1948 are estimated at about 1,000,000 tons, compared to over 1,500,000 in 1947—a decline attributable to the drop in output from the Steep Rock mine, occasioned by physical difficulties which eventually will be overcome. The Michipicoten district increased its output over that of 1947, and intensive exploration and development in that area by several companies, now including Jones and Laughlin, give promise of substantially increased tonnages from that area in the future. As is usual with the Lake Superior Canadian output, some of it is used by Ontario furnaces and much of it shipped to United States furnaces, while ore from the United States mines supplies the balance of these Canadian requirements. Chile, which supplied over 40 percent of the 1948 imports, was the largest source, with Sweden next supplying over 25 percent, and Canada, North Africa, Brazil, Mexico, and Cuba next in successive order as sources of imports.

It is apparent that imports are to play an increasing role in supplying high-grade ore to some of the United States furnaces. The important large deposits of Venezuela now being developed by "Bethlehem" and "U.S. Steel," will be next to supply substantial tonnages to seaboard plants in the near future. And the developments in the Labrador peninsula loom as highly significant to the future of the steel industry in this country.

Of the exports, most was the Lake Superior ore from United States ranges, partly exchanged for some of the Canadian range ores, and the balance was largely Utah ore shipped to Japan.

Search for New Ore Accelerated

Public interest in iron ore supplies to meet future United States requirements remains at a high point, emphasized by the continuous large demand upon the Lake Superior district which for so long has supplied about 85 percent of the United States requirements. More realistic consideration of the significance and the limitations of published figures of "taxable reserves" has removed most of the alarm evidenced in some quarters in recent years over the Lake Superior ore situation. The history of the reserve tonnages, as published year by year, in relation to the shipments year by year, reveals that the over-all decline in reserves since 1916 has been only about one-third of the tonnage actually shipped.

Continuous exploration, development, and improved technology are always at work to augment reserves and to offset shipments in substantial proportion. In some ranges other than the Mesabi, these factors in recent years have more than offset production, so that current reserves are greater than for many years. Even on the Mesabi, the reserves of 930,-054,000 gross tons, as reported on May 1, 1948, were only 5,269,000 tons less than on May 1, 1946, whereas shipments from that range in the two-year interim were 105,405,000 tons. Total Lake Superior taxable reserves on May 1, 1948, were reported at 1,132,188,000 gross tons, about 12,000,-000 tons less than in 1946, whereas over 138,000,000 tons were shipped in the two-year period. Nevertheless, no one expects that rate of recoupment to be maintained, and there is no minimizing the drain of an annual Lake Superior demand of 80,000,000 tons or more, for the Mesabi must supply three-fourths of it. Furthermore, as is well known, reserves are not distributed as between consuming interests in proportion to their requirements, nor could it be expected that they would be. Hence, the whole situation has spurred to intense activity the search for new deposits within the entire Lake Superior region and has accelerated the stripping and otherwise developing of known reserves which must be made available promptly to replace some of the great mines which supplied vast tonnages for the war period and before.

Larger, improved equipment for stripping or overburden has so greatly increased the economic limits for stripping, that instead of a ratio of three to one (cubic yards of stripping to tons of ore) which formerly was about the limit, the ratio in some operations now is six to one, and in a few places considerably higher. The resulting reclassification of underground reserves, as potential open-pit tonnage, is significant to any consideration of the period of time for which the Mesabi range may be expected to maintain its place as the principal source of United States ore. In other words, it now appears likely that most of the Mesabi reserves eventually will be mined by open-pit operations.

Extensive drilling programs have been active on all the ranges, with some holes reaching depths in excess of 4000 feet, as on the Marquette range.

Cooperative geological and magnetic surveys of the United States and state organizations have continued during the year, and give promise of important aid to exploration work, particularly in Michigan.

Significant Canadian Developments

The Labrador-Quebec development, in which The M. A. Hanna Co. is a participant, along with the Hollinger interests, of Canada, is the most significant new factor to appear in recent years in the iron-ore supply situation of North America. Development work carried on to the end of 1948 had proven over 300,000,000 tons of high-grade ore readily available at the surface, with a potential reserve of many times that figure. The next five years will be devoted to bringing this area into production on a large scale. Ten million tons per year is announced as the output anticipated when the project as now planned is completed, with later potential increase to double that amount.

Other Lake Superior ore mining and consuming interests are reported to be interested in examining iron ores in an area in Quebec southwest of the Hanna-Hollinger concession; and no doubt others will be looking at the region in the near future. The area thus far explored in the Labrador peninsula is only a fraction of the potential mineral-bearing region, which extends far to the north to Ungava Bay of Hudson Strait. Most of it is under concession to several Canadian mining groups for exploration and eventual selection of mining tracts. However, further extensive exploration will await the construction of the railroad soon to be built from the lower St. Lawrence about 360 miles to the new mining district.

The Labrador enterprise has naturally revived interest in the St. Lawrence Waterway and has aligned in its favor some of the interests which formerly opposed it. With or without the seaway, Labrador ore is likely to move in substantial tonnages to furnaces at the east end of Lake Erie, and perhaps even farther; also to move to Canadian furnaces, to the eastern United States seaboard plants, and in part to Europe. But considering the long haul, first by rail, then by water, and perhaps further by rail, to consuming points in the lower Lakes re-

gion, the cost of Labrador ore delivered at the furnaces will not be cheap.

Taconite Concentration Advances

Some observers have felt that the Labrador development may tend to slow down the program for concentration of Lake Superior taconite, but there seems little reason to anticipate that it will. By the time Labrador ore reaches its contemplated annual output, many millions of tons more will have been removed from Lake Superior reserves, so the Labrador ore may then ease the pressure upon the remaining reserves of high grade Lake Superior ore. With full realization that the United States can never allow itself to become actually dependent in times of emergency on sources of iron ore outside its borders, the Lake Superior district obviously remains the bulwark of our national strength in the production of steel—the basic defense material.

Substantial advances in the program for the concentration of taconite were made during the past year, with the starting, during the fall, of the first pilot plant on the eastern Mesabi Range. With the breaking-in period essentially behind it, next season will see this plant devoted to a thorough testing of processes developed in the laboratory for making a high grade furnace feed from finely divided magnetic taconite concentrate. Practically all of the principal mining companies and associated consumer interests are working in some manner on the taconite problem, and intensive activity continues on the cooperative project at Battelle Institute, Columbus, Ohio. The agglomeration of the finely ground concentrate into a form suitable for the furnaces is the current focal point of many of the studies and experiments.

Taconite is not the only concentration problem on which the Lake Superior industry has been active. Important additions to capacity for washing and gravity separation of so-called "intermediate" ores have been added during the year, most notable of which is the new 750 tons-per-hour washing plant at the Mountain Iron mine on the Mesabi.

Table III shows Lake Superior ore shipments by ranges of both United States and Canada for the past five years, with the percentage from each range in 1948.

Table IV shows the relationship of Lake Superior ore consumption in United States furnaces to total production of pig iron and of steel ingots in all United States furnaces—whatever their sources of raw materials. It is of some interest to note the gradual decline in the proportion of Lake Superior ore used per ton of these products, which obviously reflects the proportionate increase of other sources of raw materials. The ratios shown provide an approximate measure of Lake Superior ore requirements for a given total pig iron or total steel estimate.

TABLE III—MINE SHIPMENTS OF LAKE SUPERIOR IRON ORE
TO LAKE PORTS AND ALL-RAIL
(In Gross Tons—Thousands)

	1944	1945	1946	1947	1948*	Percent of Total 1948
U.S. RANGES						
Mesabi	62,509	58,369	46,326	59,079	64,691	76.38
Vermilion	1,539	1,446	1,330	1,430	1,556	1.84
Cuyuna	2,538	3,016	2,354	2,860	2,488	2.94
Fillmore County, Minn.	.....	.....	.....	148	353	0.42
Total Minnesota	66,586	62,831	50,010	63,517	69,088	81.58
Gogebic	5,604	4,304	3,717	5,253	5,373	6.34
Marquette	4,790	4,585	3,270	5,543	5,015	5.92
Menominee	4,876	4,241	2,590	3,668	4,012	4.74
Total Michigan-Wisconsin	15,271	13,130	9,578	14,464	14,400	17.00
Total U.S. Ranges	81,857	75,961	59,588	77,981	83,488	98.58
CANADIAN RANGES						
Michipicoten	482	514	610	498	513	0.61
Steep Rock	17	505	831	1,206	686	0.81
Total Canadian	499	1,019	1,441	1,704	1,199	1.42
TOTAL LAKE SUPERIOR	82,356	76,980	61,028	79,685	84,687	100.00

* Subject to correction when final mine figures are available.

TABLE IV—SHOWING RELATIONSHIP OF LAKE SUPERIOR IRON ORE CONSUMED IN U.S. FURNACES TO TOTAL U.S. PIG IRON AND TOTAL STEEL PRODUCTION FROM ALL FURNACES
IN NET TONS—THOUSANDS

	1942	1943	1944	1945	1946	1947	1948*
A. Production of pig iron and ferroalloys	60,903	62,770	62,866	54,919	46,515	60,117	60,900
B. Production of steel ingots and steel for castings	86,032	88,837	89,642	79,702	66,603	84,894	88,509
C. Consumption of Lake Superior iron ore in U.S. furnaces	93,760	96,975	94,902	80,864	67,526	87,335	86,980
D. Ratio—C/A	1.54	1.54	1.51	1.47	1.45	1.45	1.43
E. Ratio—C/B	1.09	1.09	1.06	1.01	1.03	1.03	0.98

* Preliminary figures.

Southern Fields Increase Output

Substantially increased output in the Southern District of the United States is evident from Table II. This includes over 700,000 gross tons of washed limonite ore, of about 43 percent iron content, from both north and south "basins" of northeast Texas, part of which moved to the furnace at Daingerfield and part to that at Houston. Further increase in the Texas output from both limonite and calcined carbonate ores is anticipated in the current year.

The Iron Mountain, Mo., operation shipped about 165,000 tons of high grade hematite concentrate, all except a small amount to the furnaces at Granite City, Ill.

Eastern magnetite output continues to rise, mainly through expansion of the New York operations, and there is every reason to believe this upward trend will continue gradually for a long time. From these ores, as mined, is produced high grade concentrate sinter, together with some lump ore, much of which moves to furnaces otherwise dependent on lake ore. Thus, the Adirondack region may play an increasing role in supplementing the latter ores, as needed.

Western Production Reaches New High

In southern California, the opening of the large Eagle Mountain deposit, with a railroad connection, is a significant development. It becomes the mainstay of the Fontana operations, where ground has just been broken for a new 1200-ton blast furnace, to meet increasing demands for iron in that area of rapidly growing population.

At the other principal Western iron

ore districts—in southwestern Utah and eastern Wyoming—ore production also increased, so that total western output for the first time exceeded 4,000,000 gross tons. Included in this was some Utah production exported to Japan. The shipments began in August on a commitment for 450,000 tons to supply furnaces formerly dependent on Manchurian ores which are now unavailable to the Japanese.

High Level Demand Anticipated

Although it does not seem possible that the rate of demand for steel in this country can continue indefinitely at such high levels as have prevailed in recent years, still, the prewar rates cannot be looked upon as any indication of future demand. Obviously, people throughout the whole world want more and more things which require steel. If mutually satisfactory and profitable bases for international trade can be established, so that American steel products can be paid for in products of these potential consumers, furnaces of the United States may long continue to be called upon for great tonnages of iron and steel, despite some anticipated decline in our domestic requirements. Hence, considering the furnace capacity essential for meeting the potential demands for steel for all purposes including national defense, it becomes evident that for the long future there is need to find and develop essentially all the iron ore reserves that can be made readily accessible to the furnaces of this country.

The people of the United States have become increasingly conscious of their dependence on iron and steel, and hence on iron ore, as the foundation of their industrial economy and their national security. Between predictions of dire disaster because of the drain on domestic ore reserves, and perhaps over-optimistic assurance that there is no need to be concerned, the truth, as has been indicated above, lies in an intelligent appraisal of many factors in the over-all situation.

Industrial Expansion to Meet Consumer Needs

The actions of the iron and steel industry, which speak louder than words, in continuing to expand capacity since the war by making enormous expenditures for new furnaces and improved facilities at plants in their existing locations, are clear evidence that the industry expects to continue to be able to supply its blast furnaces with iron ore largely from the traditional sources and by existing transportation and ore handling facilities, but with important supplementary supplies from some other sources. Obviously, it realizes the risk of ever allowing itself to become actually dependent on seaborne imports for any preponderant or critical proportion of its requirements. Thus Labrador, South America, Sweden, and any other sources of supply outside the country are to be looked to for the supplementary supplies needed to lift some of the increasing burden from the Lake Superior district.

With the improvement and expansion of processes for making furnace feed from sub-marginal ores such as the taconites, may also be expected further developments in furnace practice designed to make more usable some of the off-grade ores now largely ignored as potential supplies. Also, it appears that the use of high pressure and of oxygen enrichment in the blast furnaces, coupled with the necessary improved refractories, will also play an important role in determining what sort of ore is to be considered as acceptable furnace feed. Such changes in practice are expected to speed up and increase production of metal without great increase in number or size of furnaces.

In the iron ore situation, as well as in that of iron and steel generally, the most certain thing is that changes occurring rapidly are sure to have far-reaching effects over the ensuing years. The problems faced by these industries embrace challenges to science, engineering, and management that are not being overlooked, and the end results may well be startling to those timid souls who are inclined to keep looking backward to the "good old days" instead of forward to even better days.

From the standpoint of public policy relating to iron ore and other essential minerals the important thing is to make sure that "incentives to enterprise" are enhanced instead of destroyed in our land; that the heavy hand of taxation be lifted appreciably in recognition of the peculiar risks of mining; and that the way be kept open for the maximum application of the talents and energies of our people to productive endeavor. Given assurance on these matters, there need be no worry about the iron ore reserves we shall need in the long future. We are far from being a have-not nation, if we make it worth while for those who have the will, the energy, and the means, to make the maximum use of the natural resources available to us.

Capacity operation of the steel industry required record peacetime ore shipments

Mineral Dressing in 1948

Plant Expansion and New Equipment Among Important Developments

By A. W. SCHLECHTEN
and
T. M. MORRIS
Department of Metallurgical Engineering
Missouri School of Mines and Metallurgy

A STUDY of the developments in mineral dressing during 1948 shows that many new small plants were started to treat base metal ores because of the heavy demand for metals and the accompanying high prices. For the same reason, the large companies have expanded their plants or are planning extensive additions to increase milling facilities. The proposed expenditures total millions of dollars and demonstrate the confidence of the industry in a continuing high level for metal prices and an assurance of their ability to treat lower grade ores.

Along with the expansion of physical plant, there are many reports of the constant effort to improve the efficiency of present equipment or to supplant present methods with new processes and new equipment.

Plant Expansion

Plans have been announced by the Anaconda Copper Mining Co. for increased activity both in Montana and in Chile. A new block caving system of mining in Butte will provide as much as 15,000 tons of ore per day after it is well under way. In that some of the ground to be caved has previously been mined, the ore will be lower in grade than the usual Butte ore and will be considerably oxidized. The presence of soluble copper in the ore complicates the problem of concentration.

The treatment planned will call for a desliming step after secondary crushing to 1½ in. The sands will go to the regular flowsheet for grinding and flotation. Acid will be added to the slimes to dissolve the oxide copper, which will then be precipitated on sponge iron or detinned scrap. Flotation in an acid circuit will recover the cement copper and the copper sulfides that went with the slimes.

The new mill at Chuquicamata is a part of a $130,000,000 expansion of Chile Copper Co. facilities necessitated by the increasing sulphide content of the ore. The concentrator will treat 25,000 tons of ore per day. The feed will be crushed to ¾ in. and fed to Marcy rod mills in open circuit. The rod mill discharge will go to ball mills of the overflow type each of which will be in closed circuit with two spiral classifiers. The type of flotation machine has not been chosen yet. Tests indicate that a 35 to 40 per cent concentrate will be made.

Some future review of milling will undoubtedly describe a concentrator for the new San Manuel deposit of the Magma Copper Co. near Tucson. A drilling campaign has blocked out about 124,000,000 tons of oxide ore averaging 0.767 percent copper and about 340,000,000 tons of sulphide ore averaging 0.788 per cent copper.

Bunker Hill and Sullivan will enlarge their recently remodelled west mill so as to handle 2800 tons of lead-zinc ore per day, an increase of about 1000 tons per day. This will anticipate the larger tonnage of ore to be handled as a result of the proposed block-caving system of mining at the Bunker Hill mine.

Coal preparation plants are being remodelled and enlarged as a result of the trend toward mechanization of mining methods. Mechanical mining usually delivers dirtier and finer coal, hence a greater load is placed upon the preparation plants. Coal flotation is being used to some extent, but as greater use is found for fine coal, flotation will be even more applicable. The Driessen cone, using heavy media, has great possibilities as a cheap and efficient method for treating the fine coal.

As the nonmetallic or industrial minerals industry continues to expand, the beneficiation of these minerals becomes more important. Because many of the dressed minerals go directly to the consumer, the dressing treatment is often limited by considerations other than those of recovery and grade of concentrate. For example, barite which has been recovered by flotation may be unsuitable as a drilling mud if it is highly water repellent.

Humphreys Spirals in pilot plant at Benson Mines, N. Y., separate nonmagnetic ore

International Minerals and Chemical Corporation started operations of the new Noralyn phosphate plant. Concentration is by gravity and flotation. A 175-ft hydroseparator deslimes the plant feed, at 325 mesh, and the underflow goes to Akins classifiers. The sands of the classifier are sent through trommels and the trommel oversize goes to Humphrey spirals.

The undersize is floated with soap, after conditioning, to recover phosphate. The phosphate concentrate is thickened and acidified to neutralize the soap and then subjected to a mine flotation to remove silica. International Turbo flotation cells are used as well as Denver cells. The Turbo is a newcomer and is interesting in that the impeller is placed near the surface of the pulp, and not at the bottom of the cell. It is reported that sanding up in the cell does not occur. Advantages claimed are lower power and higher capacity. Following the trend toward the use of automatic controls, centralized remote control is used widely in this plant. Feeding of reagents and regulation of pulp density are a few of the variables that are automatically controlled.

Taconite Concentration

The concentration of the Mesabi taconites is still in the limelight. The plan for the near future seems to be to use magnetic concentration for the magnetic taconites and possibly to make the nonmagnetic taconites magnetic by roasting. The magnetic concentrate will have to be pelletized or sintered. The Minnesota pelletizing method is receiving considerable attention. It requires about 50 percent minus 325 mesh material as feed in order to obtain hard, compact pellets which will not break up when they are charged to the blast furnace.

Pickands Mather and Co. completed their plant in July which is designed to produce 200,000 tons of pelletized concentrate annually from magnetic taconite. The success of the operation has not yet been announced.

Flotation has been successful in treating the taconites, but the cost is still rather high. Minerals Separation Co. has been operating a pilot plant for the past six years at one of the Cleveland Cliffs Co. washing plants. They take Akins classifier overflow as feed and after thickening and conditioning with lime, caustic starch, and a saponified talloel, the silica is floated from the iron oxides. No desliming is practiced. An acceptable grade of concentrate is produced with a recovery of about 85 to 90 percent of the iron. Pickands Mather is experimenting with the use of cationic reagents. After a desliming step which removes about 20 percent of the iron in the feed, the silica is floated. Attempts to float the iron oxides have resulted, to date, in excessive consumption of anionic collector. However, it is reported that flotation methods have been successful in the concentration of lean specular hematite ores from the Republic formation of Michigan.

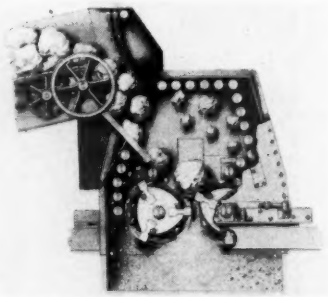
New types of gravity concentrations are being tried out on the Range. The use of spiral-type mechanical classifiers as the separating vessel seems to be preferred to cone separations in heavy media concentration. Hydraulic classifiers are being used at one property to rework old washer tailings. Humphrey Spirals are being used at the Patrick concentrator of Butler Bros. Co. Each unit handles about 2 tons per hour of minus 28 mesh feed. Another installation of about 80 spirals has been made by the Cleveland Cliffs Co. at the Hill-Trumbull mill for concentration of the finer sizes of low grade ores.

The continued decrease in the supply of high grade direct shipping ore has accentuated research work on milling methods. Excellent facilities for such work have been provided in new laboratories such as those of Jones and Laughlin at Negaunee, Mich., and of Oliver Iron Mining Co., at Duluth.

New Equipment Offers Promise

There is a never-ending battle to improve milling methods and much of the attention is given to crushing and grinding, those operations which represent a large portion of milling expense. Among the new inventions there are several that seem to have great promise.

The New Holland breaker is being installed at several mills. This is an impact crusher consisting of two



Impellers of New Holland breaker throw rock against bars until through size is reached

heavy impellers revolving away from each other. Each impeller has three bars keyed in and extending the length of the impellers. Breaker bars are placed at the top and sides of the breaker, acting like a grizzly. Material is fed in horizontally, falls between the revolving impellers, and is struck by the impeller bars and thrown against the breaker bars. Material too coarse to pass through the bars falls back and is again struck by the revolving impeller bars. The size of the product is controlled by impeller speed and spacing of the breaker bars. Since the breaker bars are round and free to rotate around their long axis, wedging of solids between the bars is minimized. The impeller bars are reversible so that maximum wear can be obtained. The speed of the impellers is from 250 to 1000 rpm. The size 3030 crusher will handle material that will pass through a 30 by 30 in. opening and that is not over 36 in. long. Other sizes are also made. It is interesting to note that impact crushing is predominant and further that the impact takes place while the solid is falling and not after it has wedged against some other part of the crusher. Because of this feature, wear is claimed to be low.

Aerofalls Ltd. of Toronto, Canada, is marketing a tumbling mill which is unique. It is claimed that by maintaining a larger than usual ratio of diameter to length of mill, and by operating at about 90 percent of the critical speed, average siliceous ore can be reduced, dry, from 10 in. to 70 percent minus 200 mesh in a 5 by 2 ft mill at the rate of 10 tons per 24 hours. This is without any grinding media in the mill. It is claimed that zones of segregation are formed, concentrically, in the mill, and each zone or layer is roughly composed of particles of a certain size and specific gravity. The material next to the shell is traveling at the greatest velocity, and the velocity of each layer is slower, the nearer it is to the center of the mill, because of slippage. The effect is to cause attrition between the particles. The larger pieces of ore are broken by impact, both by the cataracting action of large pieces of falling material striking the material at the "toe" of the load, and also by impact of the liner projections striking material in the "toe." If the diameter to length ratio is too small and if the speed is not correct, a mixing takes place and there is no segregation. An air classifier is used to close the circuit.

If tungsten-carbide balls are used to help break the larger pieces of ore, tonnage is increased to 25 tons per day. It has been found that if the ball load occupies more than 2.5 per cent of the mill volume, capacity increases 11 per cent and ball wear increases 600 per cent. It has also been found that capacity increases directly as the specific gravity of the ore. Several of these mills are operating in Canada and it is planned to construct a unit 30 ft in diameter by 5 ft long, which will have a capacity, when grinding average siliceous ore, of 15,000 tons per day, using tungsten-carbide balls. This assumes a specific gravity of ore of 4.0, a feed size of minus 18 in., and a product size of 70 percent minus 200 mesh. The power required would be 2360 hp.

Prof. A. W. Fahrenwald has developed a small crusher which in closed circuit with a fine screen can be used as a dry grinder. Laboratory tests have shown that it has a high efficiency in comparison with a ball mill grinding the same material.

Anaconda is installing three more 9 by 12-ft Marcy rod mills to be used as fine crushers. A previous installation of one mill had shown definitely that such an arrangement greatly increased the capacity of the ball mills. The success of this trial mill was the basis for adding more rod mills at Anaconda and for incorporating them in the new concentrator at Chuquicamata. An 11-ft rod mill made by the Hardinge Co. is being installed at the Sullivan mill to fine crush material for their proposed sink-float plant.

Grinding and Classification

Nordberg is experimenting with a vertical ball mill in which the balls oscillate vertically and grinding is claimed to be mainly by impact. Preliminary tests indicate a power and steel saving over conventional type ball mills.

Ball wear is dependent not only upon the kind of metal used, but even more so upon the micro-structure of the metal according to Norman and Loeb who reported the results of a seven-year test program in TP 2319, AIME.

Aerofalls Ltd. has been experimenting with the use of tungsten-carbide balls. These are made from tungsten-carbide powder with nickel or cobalt as a binder. Apparently a way has been found to make the balls so that they will not break upon impact. Some of these balls were put into one of the ball mills at a large Canadian concentrator and after a year they had lost only a tenth of an inch in diameter. Their use results in a smaller ball load and hence less power is consumed. It is estimated that the balls will have a life of about 11 years which would result in a ball cost only half of that of steel balls despite an original cost of about $5 per pound. Such balls would also be useful in application where iron contamination is undesirable.

The Dorr Co. is planning to introduce a new type of mechanical classifier, to be known as the HX Type. A new and improved head motion will impart a more rectangular path to the movement of the rakes. This new head motion is simpler than the former type and accomplishes its purposes without the use of the conventional eccentrics and linkages. One of the HX type classifiers is reported to have been giving good service at the Chino Mines Division of Kennecott Copper Corp.

Concentrating Machinery

The International Turbo and the Booth are two new flotation machines introduced recently. The Turbo has been mentioned earlier in this article. The Booth cell utilizes two impellers. The lower impeller is used to circulate pulp into the upper part of the cell which is aerated by another impeller. The upper impeller draws atmospheric air into the cell and disperses it.

Impeller speed and impeller diameter are receiving attention as variables in flotation. Galigher Co. is trying to "tailor" the impeller to fit the requirements of the ore to be floated.

Dings Magnetic Separator Co. has announced a new, high intensity, multi cross belt separator which, it is claimed, can be used on minerals with low magnetic susceptibility. It is a single pole type, each pole serving a cross belt.

Research Develops Fundamental Knowledge

Plant research is still active in the development of automatic controls. Electronic controls are being devised to control feed rates and pulp density.

Not much information is available concerning the use of ultrasonics in comminution, thickening, and other operations, but undoubtedly this field is being investigated. At the symposium on dewatering, held last February at the annual meeting of the AIME, startling results were reported when water was subjected to ultrasonic vibrations; air was forced from the water almost instantaneously. At the same meeting it was also reported that thickening was aided materially when ultrasonic vibration was applied to the pulp.

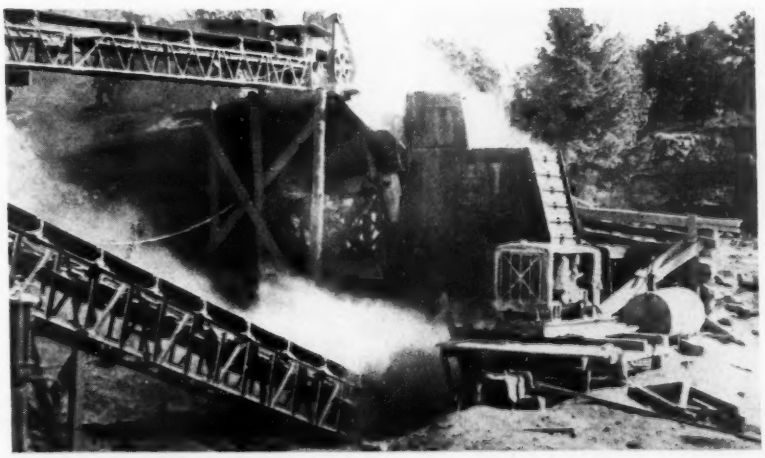
Flotation research continues along the line of developing more specific flotation reagents, especially for the flotation of the nonmtallic minerals. Radioactive tracers are used in flotation research at Massachusetts Institute of Technology. The problem of devising a suitable procedure for determining concentration of radioactive tracers, specifically carbon 14, has been solved. The next step is to utilize the tracer atom for the investigation of such problems as the distribution of collector ion between mineral surface and pulp fluid. This new toll should find use in helping to give information concerning other questions in flotation.

Another interesting technique developed at M.I.T. is the use of a high speed movie camera to photograph collisions between preformed bubbles and xanthate conditioned galena particles. Unfortunately, the proponents of different theories on the mechanism of bubble-particle attachment do not see the same thing when they are shown the same film.

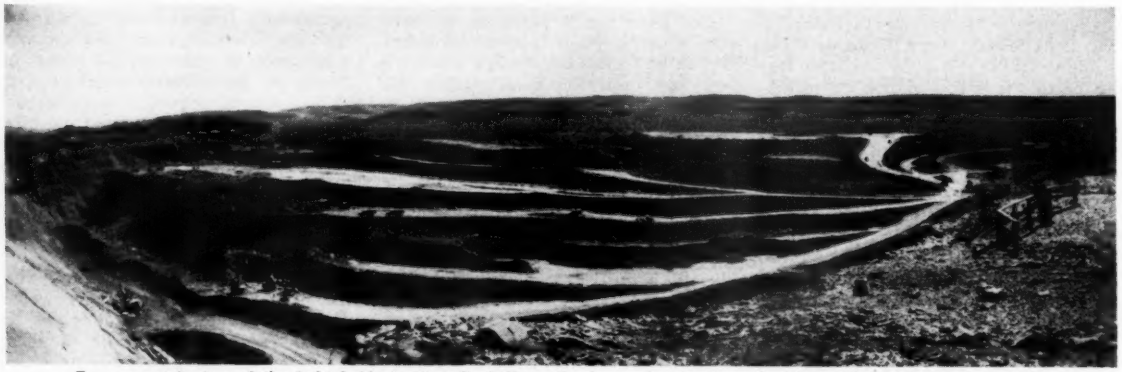
If one may hazard a guess, the future trend in mineral dressing research will be a search for fundamental knowledge. For example, in studying comminution, we do not know what happens when a rock is crushed. We must use empirical rules to guide us in design.

Mineral dressing has been a step child for so long that trained personnel have not been specifically educated to enter the field. Mining engineers and metallurgists were drafted into the mills and recently chemical engineers have been hired because of the importance of flotation, which demands a knowledge of chemistry. Fundamental research is in the domain of the university and such work can best be done by men trained in mineral dressing as a vocation.

This review would not be complete without mention of the death of Prof. Charles E. Locke. A graduate and later a faculty member at M.I.T., Professor Locke taught many of the men now prominent in the mineral industry. To others he was known as the co-author of the "Textbook of Ore Dressing" and as the author of the review of milling methods that appeared for many years in the mineral industry.



New Holland breaker at Lambert Quarries, Ga., can handle rock passing 50-in. opening



Tamaqua stripping of the Lehigh Navigation Coal Co. will mine anthracite from the Mammoth and Forty Foot seams

Anthracite

Extensive Research and New Plants and Equipment Mark Year of Progress

By W. J. PARTON
Assistant to General Manager
Lehigh Navigation Coal Co.

FAVORABLE OPERATING results as well as considerable progress in the marketing of anthracite and research on all phases of the industry can be shown by the anthracite industry for the year 1948. Furthermore, the foundation for future progress was strengthened by the activities of the year.

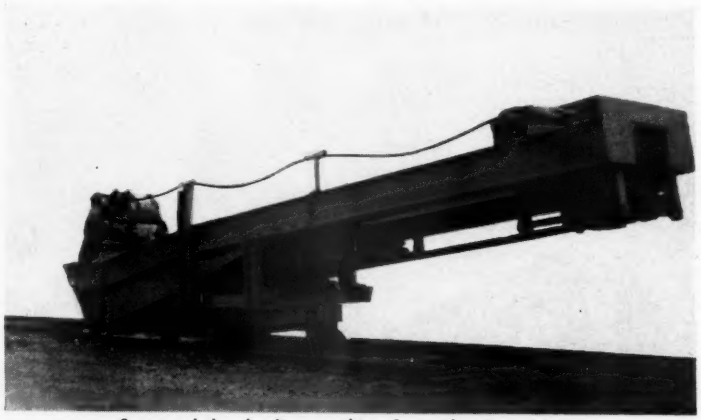
Commercial production of the industry during 1948 was approximately 54,580,000 tons, a slight increase over the previous year. Production statistics for the anthracite industry are given in Table 1. The increased production was obtained principally from underground operations by increased development and operating force. Production in 1948 was adversely affected by several factors, among the more important of which was the shortage of railroad cars at some collieries and the record-breaking warm weather in the fall. This latter condition resulted in some sizes being in long supply with consequent reduced working time in the closing weeks of the year. Operating time was 270 days, the same as 1947.

Anthracite workers, producers and dealers worked together to maintain an adequate supply of fuel so that no anthracite-heated home went cold. Some competitive fuels faced shortages early in 1948. The overseas export movement of anthracite was approximately 50 percent of that during 1947.

Employe relations were somewhat more stable than in previous years. No industry-wide suspension occurred while negotiating the new anthracite agreement with the United Mine Workers of America. However, the miners refused to work for a week to display their feelings on the matter of the $100 per month pension while agreement negotiations were underway with the bituminous operators and the union. The new anthracite contract granted an increase in the welfare levy to 20c per ton and boosted the basic day rate $1.

Significant progress was made to improve anthracite's position as a space-heating fuel. An industry advertising and promotional campaign, augmented by several outstanding campaigns of individual producing companies, was started in 1948. A successful "Fill-Up" campaign during the spring and summer months was a great contribution to the continuation of maximum production during the summer months. Anthracite stoker sales increased considerably in 1948, with further gains expected in 1949. Over 1000 Anthratubes, a revolutionary stoker recently developed, were installed in various portions of the marketing area during the year.

Additional strides were made by the industry and various research organizations working to promote new developments. Studies on gasification, pelletization, beneficiation of fines, general utilization, and mechanical mining progressed in 1948. In addition the Federal Government appro-



Scraper-shaker loading machine for anthracite mining

TABLE 1—ANTHRACITE PRODUCTION

Years	Commercial production, all sizes (millions of tons)	Total men employed (thousands)	Industry production per day (thousands of tons)	Weighted average days worked	Colliery fuel—lb per ton of production	% Pea and larger	% Buck Rice Barley	% No. 4 and larger	% from underground	% from stripping and bank	Underground production per producing employe per day	Production per total employe per day
1924	...	...	...	....	...	73.0	25.7	1.3	.	.	...	...
1939	48.3	92.6	264.	183	100	...	...	...	83.9	16.1	...	...
1940	48.2	90.8	259.	186	93	64.1	32.4	3.5	81.7	18.3		
1941	52.6	87.5	259.	203	86	62.9	33.2	3.9	79.8	20.2	4.69	2.65
1942	56.6	81.6	231.	245.1	83	62.4	33.0	4.6	76.3	23.7	4.51	2.55
1943	56.8	78.6	206.	275.4	83	61.2	33.4	5.4	71.7	28.3	4.37	2.42
1944	59.9	77.0	199.	300.6	74	60.8	33.7	5.5	66.6	33.4	4.41	2.45
1945	51.4	72.2	188.	273.0	79	60.4	32.6	7.0	64.6	35.4	4.38	2.37
1946	57.3	77.4	207.	277.2	66	59.9	31.5	8.6	63.8	36.2	4.40	2.44
1947	54.0	74.6	196.	270.8	65	58.8	31.0	10.2	65.67	34.33	4.32	2.39
1948	54.6	76.0	202.	270.0	65	58.9	30.7	10.4	66.0	34.0	4.27	2.38

priated funds for the establishment of a Research Laboratory, now under construction, and for a flood control project.

Increased Underground Production

The anthracite operators realized the need for producing larger mine output at a lower cost because of the depletion of most of the banks and necessity of obtaining stripping output from deeper and more costly stripping jobs. Increased output from the mines was obtained in 1948 principally by an increase in the underground personnel and expansion of mining operations. Unfortunately, the production per man continued its downward trend as indicated in the attached tabulation of statistics prepared by the Anthracite Committee.

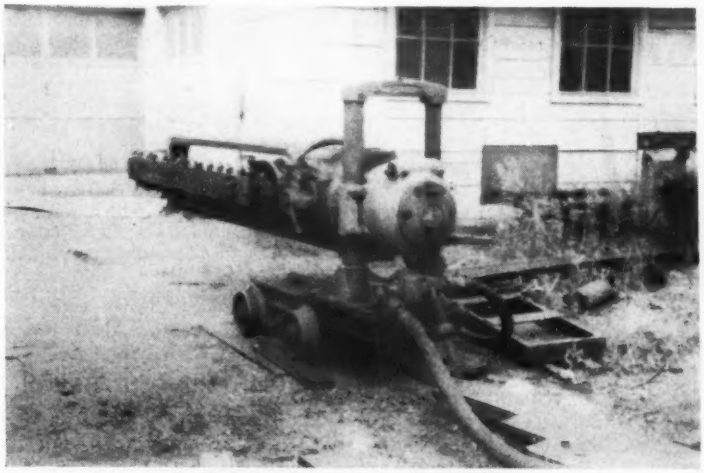
To achieve an increased mine output at a lower cost, it is apparent that the per man production must be improved. Greater strides in the development of mechanical equipment and mining methods appears to be the only solution.

Along these lines, it is encouraging to know that one of the primary functions of the Anthracite Laboratory of the US Bureau of Mines is to undertake research in connection with mechanical mining. To date, experiments have been conducted with a loading machine for thin steeply pitching beds, a light weight shearing machine and a vibrating-blade coal planer. These tests were undertaken prior to beginning construction of the new $450,000 laboratory at Schuylkill Haven, Pa.

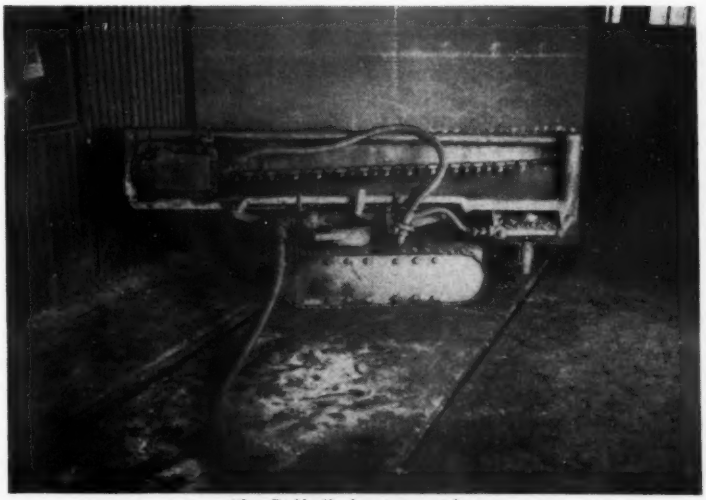
The Philadelphia & Reading Coal & Iron Co. recently announced plans for development of a new mine, the Porter Tunnel operation, near Tower City, Pa. A 4400-ft, water-level tunnel will provide access to 10,000,000 tons of marketable coal. A rough-cleaning plant will also be constructed to deliver a screened, hand-picked product over a 1900-ft belt conveyor to railroad cars. Rough-cleaned product will be prepared in the Westwood breaker of the Stevens Coal Co. Output of this mine will be 2500 tons of coal per day.

During the year, two deep-well turbine pumps were placed in operation at Kingston No. 4 shaft. This installation is part of the cooperative pumping program of the Glen Alden, Hudson and Lehigh Valley Coal Companies.

The 80th Congress appropriated $323,000 to the Bureau of Mines for continuation of the investigation started in July 1945, of the mine-flood control and pumping problems in the



Korfmann Universal shearing machine



The Eickhoff shearing machine

anthracite region. Efforts are being made to have this project underway before the end of 1948, and the organization is rapidly nearing completion. The purpose of these studies is to present data that can be utilized as a justification and for a solution of anthracite mine flood prevention or control projects.

The inundation of anthracite mines is the principal factor which threatens to cut short the life of the anthracite industry, curtail production, and affect the economic structure of the people and businesses dependent on anthracite for their livelihood. With the carrying out of the program of the Anthracite Flood-Prevention Project, mining hazards and pumping costs will be reduced and the loss of large reserves will be prevented.

Large Stripping Operations Tend to Balance Increased Underground Costs

Stripping operations produced approximately 13,100,000 tons or 24 percent of the total anthracite output in 1948. This source of production was and will continue to be of considerable importance to the operators since it can be obtained at a lower cost than underground coal. With the high cost of underground labor and tendency toward lower per man production, lower cost stripping material in many instances is a necessity to balance underground costs to make operation possible.

In order to maintain stripping output despite depletion of many of the relatively shallow outcrop jobs, the trend is toward larger and deeper stripping operations. Increased yardage to coal ratios, with consequent higher cost stripping output, are confronting the operators. As a result of the exploitation of the larger strippings of longer life, the operations require the investment of considerable capital and accurate engineering planning.

Due to the depth and limited spoil room of the larger strippings, the overburden is for the most part handled by straight shovels and trucks. The trend is toward larger straight shovels with a possible limit in bucket capacity at 8 cu yd. Because of the larger buckets, trucks are also being enlarged; 20-cu yd trucks are now in service on several operations in the anthracite region.

Several 25-cu yd draglines are in use in the anthracite field on specialized jobs. Following the trend, no further installations of the larger draglines are contemplated at present. Generally, applications of draglines will probably be limited to 8 or 12-cu yd machines due to the type of work most commonly encountered.

For drilling, 9-in. churn drills are in general use with good drill performance and blasting results obtained. A new type drill, the Ingersoll-Rand Quarry Master drill has been placed in service recently. This is a pneumatic drill capable of drilling holes up to 6 in. in diameter. Cuttings are collected with a dust collector and serve as tamping.

Scraper loaders are being used advantageously for removing banks and waste in preparation for subsequent drilling and removal of overburden by shovels and trucks. A new type of scraper, La Plant Choate model TS-300 motor scraper, is giving indications that it can be used as an economical means of loading and moving certain types of overburden for distances normally requiring truck haulage.

New models of equipment placed in operation in anthracite strippings during 1948 are as follows: HD-19 Allis-Chalmers tractor equipped with hydraulic torque converter drive; a Le Tourneau Co. Tournadozer equipped with rubber tires; an impulse cable fault locator to determine the location of faults and short circuits in the shielded, rubber-covered cable used for shovels and other electrical equipment; a Leet, three-component seismograph for determining the magnitude of vibrations on the ground at buildings close to blasting; and Model LD rear-dump Euclid, 30-ton capacity trucks equipped with 300-hp engines and Kysar shutters which work automatically to maintain engine temperature during cold weather operation.

New Preparation Plants Incorporate Modern Equipment

Preparation activities in the anthracite industry were marked by the construction of several new cleaning plants and the installation of considerable equipment in existing structures to handle specific sizes. The trend toward complete recovery of the fine sizes of coal continued in 1948, and considerable new equipment was purchased to make this possible.

A new breaker was put in operation at Repplier Colliery in February 1948 to replace the one destroyed by fire in 1947. Two 13½-ft diam Chance cones, a 6½-ft hydrotator and a 16-ft hydrotator-classifier were installed in that plant. A rough-cleaning plant at the Oak Hill stripping was constructed to deliver coal to the Oak Hill colliery and another at the Potts stripping to deliver coal to the Locust Summit breaker of the P. & R. C. & I. Co.

A new cleaning plant is also under construction at the Brookside Sheridan colliery of the P. & R. C. & I. Co. to produce No. 4 and No. 5 buckwheat coal from the Brookside slush banks. Two 6-ft hydrotators and one 14-ft diam hydrotator-classifier will produce 400 tons of coal per shift. Oversize material (+ 3/32 in.) will be screened out and hauled to the Westwood breaker for preparation. Hydraulic sluicing of the bank material to the plant will be possible by its relocation.

A heavy media pilot plant consisting of a 7-ft diam cone was operated at the Buck Run Collieries Co. during the year. Two new plants, one employing an 8-ft diam Link-Belt separator at Park Place, Mahanoy City, Pa., and the other a Western Machinery 10-ft diam cone separator with inside airlift at the Gilberton Coal Co., Gilberton, Pa., are nearing completion.

The Susquehanna Collieries Co. is constructing a froth flotation plant at the Glen Burn colliery, Shamokin, and the Hudson Coal Co.'s started construction of a Humphreys Spiral fine silt plant at Loree colliery. These two plants will make a total of three flotation plants and two Humphreys Spiral plants recovering ultra-fine anthracite, in the region.

The Lehigh Navigation Coal Co. completed construction of a 11-ft by 60-ft rotary dryer of indirect-direct type to dry the product from the Tamaqua colliery flotation plant. Also, launder screens were installed at Lansford colliery to improve the preparation of No. 4 and No. 5 buckwheat sizes.

Installation of new preparation equipment in 1948 was as follows:

	Units
Froth Flotation Machines	4 (16 cells)
Heavy Media Separators	3
Deister Concentrator Co.	26
Menzies Cones	21
Wilmot Hydrotators	35
Hydrotator Classifiers	7
Simplex Jigs	6
Chance Cones	2

The Wilmot Hydrotator process was introduced in 1948 for cleaning the larger sizes of anthracite, namely: egg, stove, and nut. Further developments have been made on the use of hydrotator-classifiers on the No. 5 buckwheat and finer sizes.

Silt Treatment Expands

Remarkable steps have been made in 1948 in keeping anthracite coal silt from entering the streams of Pennsylvania. The Bureau of Engineering of the Pennsylvania Department of Health has on file 207 active applications submitted by operators of anthracite coal preparation plants to cover the construction of silt treatment facilities at their respective breakers and washeries. The most common silt treatment plant in use is the simple silt pond, while other plants use primary sedimentation in connection with the operation of a silt pond, discharge silt-laden waste water into abandoned workings, or operate a

closed system with necessary make-up water. In the Schuylkill Basin, all of the 47 wet preparation plants have silt treatment facilities in operation.

The Commonwealth, in addition to its activities through the Sanitary Water Board, has also made substantial progress toward assuring a cleaner Schuylkill River in the future. The Department of Forests and Waters has commenced dredging accumulated silt from the river in the section from Hamburg to Norristown. Desilting dams are also proposed or under construction at Kernsville, just above Hamburg, and at Auburn and Reynolds. The functions of these dams is to prevent the carrying of silt now deposited in the upper river into the section that will have been dredged.

Considerable No. 4 and No. 5 buckwheat was used during the year in the manufacture of briquets. In this connection, the two briquet plants constructed by the War Assets Administration—at Locust Summit and Saint Nicholas breakers of the P. & R. C. & I. Co. were purchased by the Reading Briquett Co. in the fall of 1948.

In the latter part of 1948 the Lehigh Navigation Coal Co. announced the formation of Lehigh Materials Co., a wholly-owned subsidiary, to produce and market lightweight aggregate from the recently-constructed plant. The aggregate, called Lelite, is especially adapted to use, with cement and water, in making high strength concrete where light weight is a major factor, as for poured structural concrete and precast concrete structural products. Lelite is produced by bloating selected breaker slate in furnaces developed by the Lehigh Navigation Coal Co.; the bloated material is crushed and screened into various sizes required for its several applications.

Notable Progress in Anthracite Research

Considerable progress was made in 1948 in anthracite research developments by the research organizations working to further anthracite interests.

The Anthracite Institute was furnished $668,000 from the anthracite producing companies for a large and continuous advertising and promotional program in 1948 to sell the advantages of anthracite. This campaign was carried out with favorable results. The summer "Fill-Up" campaign was successful and a tremendous increase in stoker sales resulted. A revolutionary home-heating unit, the Anthratube, was placed on the market in 1948 by two manufacturers, Axman Anderson Co., Williamsport, Pa., and Bethlehem Foundry and Machine Co., to culminate several years of research and development by the Institute. The basic elements of design in the unit are the Anthratube and centrifugal heat absorber principles, both principles being entirely new in burner and boiler design. The present Anthratubes being sold commercially are for steam, hot water, or vapor heating with capacities approximating 130,000 Btu's and with an operating efficiency of better than 80 percent.

A pilot plant was constructed for research on the fluidized bed process, for producing fuel and synthesis gas from anthracite silt. The first practical use of this process is seen in the production of a producer or mixed gas, which anthracite collieries can use as a colliery fuel. The next logical use of the process is to produce a synthetic gas that may be utilized by petroleum companies in the production of synthesis fuel products and by chemical companies in the manufacture of products such as synthetic ammonia and synthetic methanon.

Pelletization, or the up-grading of fines by extrusion is also being investigated. A pilot plant extrusion machine has been designed and constructed in cooperation with the J. F. Pritchard Co. of Kansas City, Mo. This pilot plant has a design capacity of five to ten tons per hour and has recently been placed in operation. The cost of pellet production on a commercial scale will be determined and sufficient pellets will be produced for several large scale tests in combustion equipment and in a water gas producer.

Anthracite research has been continued at the School of Mineral Industries, Pennsylvania State College. Laboratory studies were pursued to provide basic data upon which gasification equipment design can be based. Results indicate the advantages of using relatively pure oxygen instead of air for the gasification process and the suitability of anthracite and anthracite synthesis gas. Field studies on various fine coal cleaning processes have been made and are continuing to determine advantages and limitations of each. Studies have been continued on the blending of small percentages of anthracite fine with bituminous coals used for the manufacture of by-product coke. Detailed blending practices and experience records from a number of by-product plants using anthra-fines have been accumulated and reported. An extensive research program was undertaken to determine the best conditions for use of anthracite as a cupola fuel. Best conditions for its use in modern high speed iron melting operations and on the characteristics of the various anthracite available for its use are being investigated. Studies on the flow of gases through deep beds of fuel have also been extended in order to secure information on how much of the gas admitted to the bottom of the fuel bed actually passes through the fuel and how much passes up along the walls and has little contact with the fuel.

Supplementing the program on mechanical mining research initiated by the Bureau of Mines and pending the construction of the Federal Bureau of Mines Research Laboratory at Schuylkill Haven, Pa., this laboratory will serve as a center of information on matters pertaining to conservation of anthracite reserves; efficient preparation and utilization; developing new uses for anthracite; and promoting safety, health and sanitation in anthracite mining operations. The work of the laboratory will serve to strengthen and supplement the work now being done by the anthracite industry and other organizations on

(*Continued on page* 96)

Heavy-Media plant of Lehigh Valley Coal Co. at Mahanoy City, Pa., nears completion

Mining Geology and Geophysics

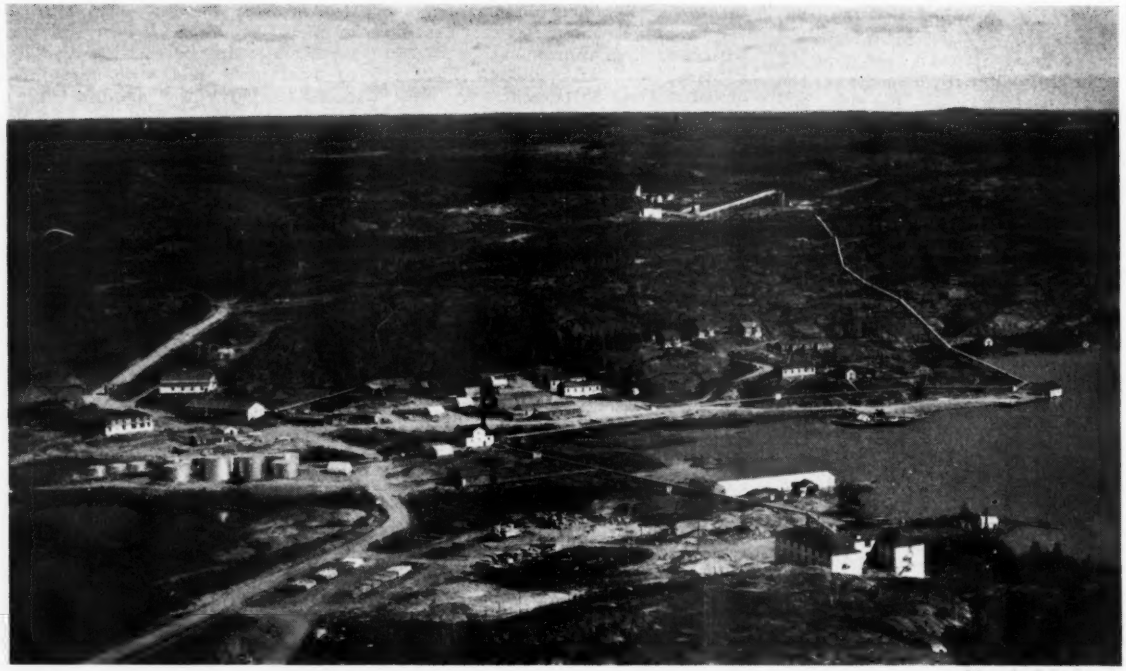


Photo by John Rennie

Giant Yellowknife gold mine, N. W. T., Canada, reports exceptionally rich ore. General aerial view of the camp with No. 2 shaft and treatment plant in middle distance

Investigation and Research Projects Aid Search for Mineral Deposits

By CARL TOLMAN
Head, Department of Geology and Geological Engineering
Washington University

DISCUSSION OF the mineral position of the United States has continued unabated throughout the year with wide range in opinion, from a "have" condition on one hand to a "have not" condition on the other. However, out of it there appears to be emerging a widely held and encouraging viewpoint. It is that potentialities for significant ore discoveries remain in the country and they constitute a challenge to the sciences, or arts, of mining geology and geophysics to locate them and to mining companies and other sources of finance to provide funds for the purpose.

Understandably, on the face of it, the picture presented by the country's mineral position at the close of the war and immediately following was discouraging. Under the urgency for production during the war period, the reserves of good grade ore were seriously depleted. Of course, the bare ore reserve picture, at the best, is not in itself a measure of eventual production possibilities, a fact not fully realized by some. In many mines it is not economically feasible for various reasons to maintain reserves far ahead of production. Some reasons are the tax situation and the economic undesirability of tying up capital in developing ore far beyond the immediate need. Indeed, in mining operations on some occurrences of ore and industrial minerals, characteristic of pegmatites, for example, appreciable reserves cannot be blocked out before mining and only a hand-to-mouth existence is feasible.

However, the picture would not have been nearly so depressing if circumstances during the war had allowed mineral prospecting, exploration, and development to proceed as vigorously to keep up reserves, as such exceptional production would normally call for. Much slack in these activities had to be taken up. Generally speaking, mining companies have accepted this obligation in a vigorous manner with the result that the reserve situation of many mining operations has held its own or improved in the face of continued high production.

There is an analogy with the petroleum industry. For several decades the statement has been current that petroleum resources would last only another 20 years. Certainly the success of the application of geology and geophysics to find pools and the advances in production and recovery technology have been beyond the imagination in keeping us well supplied with petroleum in the face of fantastically increased consumption. It should continue to assure us petroleum supplies well on in the future.

We should not sell the mining industry short by assuming that mining geology and geophysics are not capable of rising to meet the need for new mineral deposits within the country, that ore dressing and metallurgy will not solve problems of beneficiation and extraction for lean or otherwise difficult materials. Sufficient "venture" capital must be made available to test legitimate geological and geophysical interpretations suggesting

the occurrence of a mineral deposit and carry through exploration and development to the stage of production. Such matters are considered in detail in "From the Ground Up," McGraw Hill, 1948, Paul Tyler's useful presentation of the economics and problems of the mineral industry.

Of basic importance is the necessity for the existence of capital willing to take the risks inherent in finding a mine and developing it. Such capital is available only if the expectable return to the successful venture warrants the risk taken. During the year, despite high metal prices, the long-run situation has remained somewhat clouded. Features of the tax structure, tariffs, and SEC regulations are considered unfavorable. Labor difficulties, rising labor and material costs add to this discouragement. Gold mining is in an especially difficult position with a fixed price and rising costs and mercury and tungsten mining is hard hit by imports. Government subsidies are being debated pro and con. Purchases for the National Stockpile are being made. It should be emphasized that a sure way of making a "have not" condition an actuality is to dry up the source of "venture" capital.

Ira Joralemon, in a paper presented before the annual meeting of AIME, February 1948, and published in the April 1948 number of *Mining and Metallurgy*, presents the accomplishments of mining geology, geophysics, and progressive management in adding new mines to the list of producers during the last ten years. The record is even more impressive if the reserves added to operating mines are taken into account. It provides encouraging reading as it serves to emphasize that continued effort should bring to light other significant deposits in the future. Since, as time goes on, new mines will become increasingly harder to find, correspondingly more rigorous demands will be made on those concerned with their discovery. There must be tested in the future relatively more geological and geophysical "bets" than actually exposed indications of mineralization. It is up to the mining geologist and geophysicist to see that capital gets "a run for its money" in such ventures.

During the year, Hugh McKinstry has rendered his profession a distinct service in the publication of his book, "Mining Geology." He has gathered together the fruits of the experience of seasoned practitioners. It shows well how a mining geologist goes about practicing his profession. Since the mining geologist must apply his scientific knowledge with ever-increasing effectiveness, he must not be satisfied with the current techniques of investigation and philosophies of ore search, but he must also develop and apply new ones.

More Mapping Needed

Generally speaking, discovery of new mines is the fruit of a mass of accumulated knowledge and interpretations brought to bear on the specific locality. Basic to it are the regional and local geological maps and related geological and structural studies, the production of which is taken as a prime function of geological surveys or other government agencies. The need for such work is insistent. Results of early investigation tend to point the need for more detailed geological investigation and mapping. This information serves as a guide for specific local investigations in the search for mineral deposits.

In response to such needs, geological surveys of this country and Canada have carried through full programs during 1948. The Geological Survey of Canada as well as some provincial surveys are especially geared to supply geological maps and fundamental geological information of value in the search for mineral deposits. About 73 percent of Canada has yet to be mapped on any scale. The accent, latterly, has been on the remote regions of the Dominion, in areas where metalliferous deposits are either known or may be expected to occur, such as within the Canadian Shield or the Cordilleran province. New mining fields and mining camps are continually opening as this work proceeds and the general picture is encouraging.

The Survey reports that more interest is now being taken in the Arctic islands than for some time past, and it is the intention to augment the geological information on this large region (land area more than 50,000 square miles) as rapidly as facilities will permit. A summary of present information is contained in the recently issued third edition of the "Geology and Economic Minerals of Canada."

Widespread Survey Projects

The greater part of the United States also remains inadequately mapped and the U.S. Geological Survey and the various state surveys are steadily utilizing their facilities to their fullest extent in correcting this deficiency. The Section of Mineral Deposit, U.S. Geological Survey reports that: "During 1948, 82 field, laboratory, and report projects were carried on in 28 states in the field of metalliferous and nonmetalliferous geology. Because of the critical need for base metals, 24 of these projects dealt with copper, lead, and zinc. Fifteen projects were concerned with deposits of iron and ferroalloy minerals such as tungsten, chromite, and manganese. The most concentrated efforts of the section were directed to new projects on extensive phosphate deposits of Florida, Idaho, Montana, and Utah and to the continuation of the work on vanadium deposits of the Colorado Plateau. Pegmatites, as sources of feldspar, mica, tantalum, beryllium, and lithium minerals were studied in 12 localities. Investigations were also continued on mercury, alunite, bentonite, flourspar, magnesite, potash, talc and granite. Thirty-four long-range projects of geologic mapping and related laboratory investigations, begun prior to 1948, were continued throughout the year.

"Five exploratory drilling projects in Arizona, Colorado, Idaho, South Dakota, and New York were pursued with satisfactory results, and three of these were completed. The project in the Gouverneur District, N. Y., which was conducted in cooperation with the Bureau of Mines, was of particular interest because it discovered the continuation of the talc-bearing formation and thereby stimulated the interest of private companies and led to the expansion of their activities in this area.

"Cooperative agreements for geologic work in ten states were continued with fruitful results. Likewise, cooperation with other bureaus in the Department of the Interior expanded to the mutual benefit of the bureaus and the public. In this connection six field projects were underway on the Missouri River Basin as a part of a general program for the development of this area. As a result of completed studies, three maps, with marginal texts, showing the occurrence of constructive materials, nonmetallic mineral resources and lead and zinc deposits were released."

Bureau Investigations

The U.S. Bureau of Mines as part of its program relating to mining geology in common with some other government agencies was actively concerned during the war years in the investigation and development of strategic and critical mineral deposits. The Bureau is now concerned with publishing the large backlog of data accumulated during the period and the field investigation of strategic minerals is continuing with the necessary change in tempo and emphasis required by peacetime. Fifty active projects in 27 states and Alaska were conducted during 1948. Diamond drilling comprised the greater part of the development work but several projects include churn drilling, trenching, test pitting, underground rehabilitation and sampling, experimental mining, and the compilation of mineral atlases. The commodities investigated and number of projects for each commodity were lead-zinc (24), copper (7), pegmatite minerals (3), titanium (3), iron (2), tungsten (2), tin (2), and one project each on mercury, bauxite, chromite, graphite, sillimanite, talc, and vanadium. The Bureau also re-

U. S. Geological Survey drills Big Calamity Mesa, Colo., in widening search for uranium

ports that following the success of their core library at Mount Weather, Va., they are now working on establishing core libraries in Alaska and Rolla, Mo. Plans are also made for libraries in Salt Lake City, Tucson, Ariz., Reno, Nev., and Minneapolis, Minn. Mining companies are invited to use the storage facilities to store and record their drill cores. Extensive use of these facilities by mining companies would greatly enhance their value. Few examining engineers have not had the experience of wishing that abandoned cores in a district being examined had been available for study.

Given the geological setting, the geological structure serves as one of the most basic guides in the search for ore. The emplacement, form, and extent of many ore deposits appear largely controlled by geological structure. In 1948 a major event occurred in the publication of "Structural Geology of Canadian Ore Deposits" in commemoration of the fiftieth anniversary of the CIMM. It incorporates a review of the structural geology of Canada and descriptions of individual regions, districts and mines by more than a hundred contributors. As stated by McKinstry, in reviewing the book, "It is a landmark in the accurate observation of structure and the interpretation of ore deposits in structural terms."

Geophysical Work Undertaken

If the challenge of maintaining our mineral position is to be met, new methods of investigation must be evolved and utilized as aids in the search for ore. Although the mining industry should admit an obligation to carry on research in this direction it is also an appropriate field for government agencies. Substantial progress has been made by the latter during the year in connection with geophysical and geochemical methods.

The Section of Geophysics, U.S. Geological Survey, has carried out a large amount of mining geophysical work during the year. Some of it consisted of areal studies and much of it was of experimental nature aimed at providing useful information in mining geophysics or in the whole field of exploration geophysics. Most of the projects are not sufficiently advanced to permit any presentation of results. The Section has been active in the adaptation and use of the airborne magnetometer and reports that aeromagnetic surveys have been made in the following districts or regions for the purpose of obtaining geologic information that might aid in mineral exploration: Lake Superior Iron and Copper regions; Coeur d'Alene district, Idaho; southeast Missouri lead and iron districts; Silver Cliffs district, Colo.; Tintic district, Utah; Carson Sink, Steamboat Springs and Comstock Lode districts, Nev.; and Laramie Range, Wyo.

The following ground geophysical projects, directly or indirectly related to mineral exploration were carried out during 1948: gravity studies in the Tintic, Utah district, special experimental work on lead-zinc problems in the Illinois-Wisconsin area, measurements in the Galax area, Va., to study the effects of current density and polarization techniques, studies of permafrost problems in Alaska, studies of geophysical phenomena accompanying mineralization in the Steamboat Springs area in Nevada. In addition, experimental instrumental work was done on new-type magnetic, electrical, and seismic equipment; and further work was done on theoretical methods of evaluating aeromagnetic and electrical resistivity data.

The Geological Survey of Canada has recently established a division to deal with various lines of field and laboratory research in geophysics. In metalliferous areas, studies have been made and published on the use of the ground magnetometer and within the last year or two a total of 39, 15 by 30-ft map areas in Quebec and Ontario have been flown by the airborne magnetometer and the results are in process of compilation on one-mile topographic base maps. It is anticipated that such maps should be of great service to geologists mapping these areas.

Geochemical Prospecting Planned

The Section of Mineral Deposits, U.S. Geological Survey, reports continued research work on the development of geochemical methods. "Field projects during 1948 included a study of the distribution of zinc in ground and surface water and residual soil in relation to the zinc deposits of the southwestern Wisconsin zinc district; a study of the distribution of copper in ground water, residual soil, alluvium, and vegetation at the San Manuel copper deposit in Arizona; and a further study of the distribution of heavy metals in alteration zones over blind orebodies of the East Tintic district, Utah. Primary emphasis during this period has been on the development of rapid, simple, semi-quantitative analytical tests for ore metals, suitable for use under field conditions. Work has been completed on developing methods for the determination of zinc in soil and vegetation and is nearing completion on tests for copper in the same materials. It is anticipated that within the next year several field parties can be equipped with field analytical kits for experimental geochemical prospecting work in connection with other projects of the Section of Mineral Deposits."

Geophysical (electrical resistivity) field party in southeast Missouri

Research Adds New Knowledge

Some exceptionally fruitful studies on rock alteration in relation to metallic mineralization have culminated during the year. Particularly noteworthy are the studies carried on by Reno Sales and Charles Meyer of

the Anaconda Copper Mining Co. in their Butte laboratory. Some results were presented in an outstanding paper before the annual meeting of the AIME in New York in February 1948. Also, a wide study by T. S. Lovering of the rock alteration in the East Tintic District, Utah, is in press as a monograph in Economic Geology. John S. Brown's book, "Ore Genesis, A Metallurgical Interpretation," Hopewell Press, Hopewell, N. Y., presents a challenge to existing concepts and is an example of the searching inquiry of ideas that must continue if the science is to become more effective. During and following the war a concentrated study of pegmatites throughout the country was carried out. It is now being assembled in a monograph for publication. It should add greatly to our knowledge of these rock bodies and the deposits of metallic and industrial minerals associated with them. These are only some of the highlights among numerous papers that have appeared during this year that contribute to the body of knowledge of significance in the application of geology to mining.

Although some mining companies are active in fundamental research related to mining geology, so well exemplified by the Anaconda Laboratory at Butte, and the operation of more such laboratories could be to the advantage of the industry. In this regard the industry suffers in comparison with the petroleum industry in its concern with petroleum geology. Although the comparison is probably not wholly just, the petroleum industry does stand out with major companies supporting research laboratories partly concerned with petroleum geology, geophysics, and geochemistry. The API research program and the generous and widespread support by petroleum companies of fellowships and research programs in geology in universities is noteworthy. The provision of summer work for students as a factor in their geological training is also becoming more general. Admittedly, mining companies also support similar activities but it is felt more active participation would pay significant dividends in the advancement of the science of ore hunting and by attracting into the profession more competent and thoroughly and specifically trained geologists.

Ore Search Results

It would be appropriate to point out some mining developments, as product of the search for ore, that stand out during the year. One of the most significant is the development of the iron deposits in Labrador and New Quebec. J. A. Retty has provided the geological direction to this important undertaking. In October 1948, attainment was announced of the objective, 300,000,000 tons of open-pit ore blocked out, required to warrant the capital expenditure necessary to bring the deposits into production and provide transportation and other facilities. In Quebec also, the Lake Allard ilmenite-hematite deposit is another promising mining development of international significance. Some 200,000,000 tons of high grade titanium-iron ore have been developed. Interestingly enough J. A. Retty, while carrying on geological investigations and mapping in the region for the Quebec Bureau of Mines, made the original discovery.

Continued high prices for lead and zinc tend to intensify the search for deposits. Developments in this country that can be recounted are, for the most part, in old mining camps. The new zinc ore bodies in the Hanover-Santa Rita area, N. M., and in the Ouray District, Colo., are of especial significance. For lead, the continued developments in the old Darwin District of California and in the Coeur d'Alene District in Idaho are of significance. Ventures, Ltd., currently halted by water trouble from reaching the silver-lead-zinc ore indicated by drilling at Eureka, Nev., is expected to proceed with the development. In Canada the Bachelor Lake area, Quebec, where Dome Exploration Co. is exploring a promising silver-zinc deposit, is receiving much attention. Also in the Northwest Territories there are two centers of attention; one at Pine Point on the south shore of Great Slave Lake, where Consolidated Mining and Smelting Co. and Ventures have obtained a 500-square-mile concession covering an area of potential lead-zinc deposits. The other is at Indian Mountain Lake north of the east arm of Great Slave Lake where an old-time staking rush was precipitated following the reported taking over by Hollinger interests of a promising high-grade zinc discovery. At Mayo, Yukon Territory, the Yukon United Keno Hill mines brought into production a rich silver-lead deposit. Attention should also be called to the development of new lead-zinc deposits in Uganda, Africa.

As for copper, large tonnages have been developed in this country in recent years and the continued success at the San Manuel ore body in Arizona, the White Pine mine in Michigan and the Yerington ore body in Nevada is well known. Similarly in Canada, the Quemont deposit in Quebec is proving out successfully on development. At Lynn Lake, Manitoba, Sherritt Gordon Mines Limited is proceeding with development of the "A" copper-nickel ore body. It is interesting to note the successful application of magnetic and electrical resistivity geophysical methods in locating the Lynn Lake deposits. Gold did not receive the financial encouragement during the year that was enjoyed by the base metals. Not only is this true in this country but also generally throughout the world. However, in Canada, despite a marked decrease in prospecting and exploration activity for the metal, substantial developments took place. The highlights were the expansion of the Kerr Addison mine to a daily production of 4000 tons and the bringing into production of the Giant Yellowknife mine in the Northwest Territories. Four years of concentrated exploration and underground development at this mine have disclosed the greatest number of ounces of gold per vertical foot of depth yet recorded for any Canadian gold mine.

Interest in exploration for radioactive materials has been active during the year under the stimulus, in this country, of the Atomic Energy Commission which announced its program in April. The treatment plants and buying stations in the Colorado-Utah area should do much to encourage exploration and production there, especially from small deposits. In Canada, J. D. Bateman reports that the lifting of restrictions on private development has resulted in a large number of new discoveries, several of which appear promising. They include the Camray Prospecting Syndicate prospect at Theano Point, north of Sault Ste. Marie on Lake Superior and other nearby discoveries made subsequently. Near Goldfields on Lake Athabasca, Saskatchewan, Eldorado Mining and Refining Ltd. and Nicholson Mines Ltd. are developing prospects. In the same province, at Black Lake, east of Lake Athabasca pitchblende has been found at intervals in an extensive mineralized belt.

In addition to those directly quoted in this article a number of geologists have kindly given me information and suggestions for the compiling of the material presented. They include Duncan Derry, Alan Bateman, John A. Dresser, Clive Cairnes, Charles Will Wright, Harry Gunning, A. K. Snelgrove, H. R. Joesting, James Boyd, J. A. Retty, H. J. Fraser, T. Koulomzine, LeRoy Scharon, Olaf Rove, Frank Ebbut, B. L. Wilson, John F. Walker, and Joel Swartz.

Significant Developments in the Mining Industry's Labor Relations Field

Elusive Goal of Industrial Peace Can Be Reached Through Better Understanding

By JAMES K. RICHARDSON
Manager
Utah Mining Association

UNQUESTIONABLY THE influence of the Labor-Management Relations Act of 1947 can be seen in virtually all 1948 developments in the labor-management field. The policies of the National Labor Relations Board, unions and employers, with respect to operating under the new rules, have had to be changed and those policies have, to a large extent, "jellied" during this year.

The Board has had an opportunity to study and rule upon the broad categories of union unfair labor practices and has clearly indicated its interest in the realities of industrial relations. This does not mean that it has ruled, always, on the employer's side, as, for example, its ruling on the law's meaning in banning union "restraint and coercion." A biased interpretation would have outlawed almost any strike opposed by some few employes. It has, similarly, not hesitated to order a union not to strike for unlawful objectives, and has recognized the dangers of unlawful picketing.

Employers have had every opportunity to flood the Board and the courts with suits for damages, requests for injunctive relief, and requests for union prosecution. A cautious attitude, however, has been displayed in invoking action against the unions and it is suspected that this is not due to a lack of knowledge of their "rights" but rather to an early recognition that aggressive actions before the Board or the courts would not improve the relationships at their own properties.

Union policies, with respect to the L-M Act, have been varied and, of course, dramatic. Five features of the new law have drawn most of their fire:

(1) Requirement of the filing of the non-Communist affidavit and other data

(2) Restrictions placed on strikes and boycotts

(3) Restrictions on "union security"

(4) Restrictions on political expenditures during national elections

(5) Restrictions on mass picketing

Non-Communist Pledge Creates Furor

The first of these brought about the most sweeping developments. Some unions quickly decided to file non-Communist affidavits in order to take advantage of those provisions favorable to unions. In general, however, a boycott against the facilities of the NLRB existed. This was accentuated by a ruling by the Board's general counsel that all officers of parent union bodies must also file the non-Communist affidavit. When Phillip Murray of CIO and John L. Lewis of the AFL refused to sign, these two powerful bodies and their affiliates were cut off from facilities of the Board.

However, at its 1947 convention when the AFL voted away John L. Lewis' office of vice-president, leaving only two officers, a president and a secretary-treasurer, they also decided that these officers would sign the non-Communist affidavit. Neither action was approved by "friend John" and culminated in his histrionic note to Bill Green stating: "We disaffiliate." Soon thereafter the Board overruled its general counsel and held that it was not necessary for the officials of

Going on shift at the Mountain Con at Butte

the parent body to sign. This left the individual unions free to chart their own course insofar as signing or continuing the boycott was concerned. Many immediately came into compliance, including the powerful United Auto Workers.

Latest available figures indicate that 87,131 officials representing 166 national and international unions and 9749 local unions have signed the non-Communist affidavits and are in compliance with the Act. Notable exception to the above, in our industry, is the International Union of Mine, Mill, and Smelter Workers and their affiliates.

The non-Communist pledge had a dramatic effect other than cutting non-complying unions away from the facilities of the NLRB. Actually it brought about a clean-cut break between left and right wing factions within many unions. Locals seceded to affiliate with complying bodies so as to have available the facilities of the Board and others seceded as a result of differences existing between the parent body and the locals, insofar as political ideology was concerned. Such was the case in Mine-Mill.

Attempts by the Mine-Mill leadership to lay the secession movement within its ranks at the doorstep of the L-M Act are ridiculous for the history of their secession movement predates Mr. Hartley's efforts to legislate industrial peace.

The Communist issue was first brought to light at Mine-Mill's convention at Joplin, Mo., in 1941. The left wing group, led by Reid Robinson, sought there to gain control of the executive board and failed. However, it was apparent to the radical element that this control was essential and the by-passing of democratic trade union principles and processes is alleged to have had its start there.

Although Mine-Mill's convention in 1943 at Butte, Mont., heard rumblings about "Commies," the issue was not brought onto the floor of the meeting. All members of the union were too much involved in the part they were playing in winning the war and there existed little difference in the objectives of the right and left wing factions.

In 1946, however, District Union No. 2 and the Utah State Industrial CIO Council passed a resolution barring known or admitted Communists from holding offices. They thought so well of this American procedure that the same resolution was introduced at Mine-Mill's convention that year in Cleveland. The resolution failed of adoption by the delegates by 24 votes! This fact, plus an airing of an alleged scandal involving Mine-Mill's president, Reid Robinson, and a $5,000 "loan" from an employer widened the breach still more.

The issue became clear-cut following the Union's referendum election of November 4, 1946 when the conservative elements were voted almost completely out of membership upon the Union's executive board and replaced by their radical brothers. Election certifications made by the canvassing committee brought out a minority report by the conservative representatives on the committee which alleged fraudulent voting, forged ballots, stuffed ballot boxes, coercion, and general failure of democratic processes.

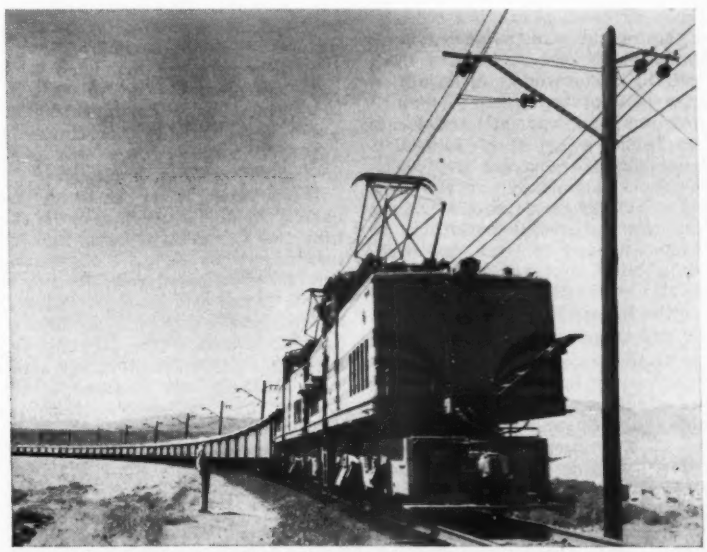
Ten locals of District No. 6 (Connecticut Valley) went into open revolt against Robinson's leadership on January 27, 1947. Robinson was barred from a district wage conference and the officials, according to the press, issued a statement attacking Robinson's leadership as one "that faithfully follows the Communist Party line." The statement also carried the remark that early meetings had been called to discuss withdrawal from the International.

Reliable information indicates that every local in District No. 2 had scheduled a vote on the subject of withdrawal but were dissuaded by knowledge that Phillip Murray had asked that the CIO have an opportunity to thoroughly investigate the breach within Mine-Mill. This request, however, did not deter the membership in District No. 6 and soon thereafter 28,000 members bolted Mine-Mill and banded themselves together as the Progressive Metalworkers Council.

Murray's Committee investigating Mine-Mill rendered their report on May 16, 1947 and found that Maurice Travis, then serving as president of Mine-Mill, "and other international officers of the IUMMSW have allowed the influence of the Communist Party to interfere with the internal affairs of the International Union." It specifically recommended that Travis resign or be removed from office and that an administrator and administrative committee be appointed by Murray to conduct Mine-Mill's affairs and heal the internal breach. Resentment flared up throughout Mine-Mill locals due to the efforts of its International officers to suppress this report and its damning indictment.

No Pledge—No Recognition

On May 13, 1948, the four major operating companies in the Park City District of Utah supplied the spark that set off the powder train. Their locals had written them on April 22, suggesting that negotiations be started respecting modification of contracts which expired on June 30. W. H. H. Cranmer, president and general manager of the New Park Mining Co., wrote to say that his company would be glad to meet at any time with the local union, but that it would not meet with representatives of IUM-



During the 15-week strike of 311 mine railroad employes, all production ceased at the Utah division of Kennecott Copper Co.

MSW so long as they declined to sign the non-Communist affidavits. Paul H. Hunt, vice-president and general manager of the Park Utah Consolidated Mines Co., on the same day, wrote his reply which stated, in part, as follows:

> "However, we believe that if your local union is to be represented by the International Union of Mine, Mill, and Smelter Workers, then the officers of that union should comply with the provisions of the Labor-Management Relations Act of 1947 relative to the filing of non-Communist affidavits.
>
> "This company feels it has an obligation to the nation, to the community and to its employes to support the Congress of the United States in its efforts to insure protection against subversive elements within our country and we trust your organization shares our feelings in this regard.
>
> "May we have an expression from you in respect to this matter in order that a date for negotiations can be determined?"

The following day, May 14, representatives of various negotiating committees made a statement for the press that they were still determined that the executive board of IUMMSW should sign the non-Communist affidavits. The press further reported that the local representatives were decidely "cool" toward the prospect of striking July 1 for recognition of IUMMSW. These meetings were held in the presence of Reid Robinson who immediately labeled the stand of the Park City operators as "phoney" and inspired "only to divert attention from tremendous profits." Nevertheless all the major mining and smelting companies terminated their contracts with IUMMSW, and several, in announcing the terminations, stated that they believed the signing of the non-Communist affidavits should preface negotiations of new contracts.

All of these operating organizations in Utah, with one exception, took a positive stand and insisted that the signing of the non-Communist affidavit was a prerequisite to their bargaining. The leadership exhibited was adopted by operating companies in other areas, and affected locals either broke away from Mine-Mill and negotiated a contract, are working without a contract, or are currently on strike for Mine-Mill recognition. At the present time there is only one company in Utah operating under a labor contract with an affiliate of Mine-Mill and in that instance the International is not a party to the agreement.

One of the major publishing houses in this country has repeatedly called to the attention of the world that we should "never underestimate the power of a woman." The Women's Auxiliary of Mine-Mill has been, for several years, one of the outstanding groups advocating freedom of their "men folk" from the yoke of Communism. Mary Orlich, president of the Auxiliary, blasted the Communist domination of Mine-Mill at their meeting last year and again at the Salt Lake City meeting on September 13. She stated that her organization was one of the first to "have nerve enough to openly fight the Red issue." Their "men folk," however, at Mine-Mill's 44th Convention held in San Francisco this year, showed the world who wore the pants—they voted 396 to 179 against submitting the matter of compliance to a referendum vote of the members.

In discussing this Red issue one must also look at the actions taken with respect to Mine-Mill by our sister republic to the north—Canada. Mine-Mill was expelled from the Canadian Congress of Labor; and at the same time American-born Mine-Mill organizers and officials (including Reid Robinson) were deported. Our own government refused to allow Mine-Mill representatives to enter this country to attend the San Francisco convention. These actions by the Canadian government, Canadian labor, and our own government, are attributed to the foreign ideologies embraced by Mine-Mill.

Solid Front Might Quell Communist Issue

Disappointment has been expressed, in some circles, over the fight the metal mining industry and its affiliates have made on the Communist issue. This feeling stems from the fact that the industry, early, indicated that a solid front would be presented and the issue disposed of once and for all. One after another, many operating organizations changed their implied positions and found ways and means to justify dealing with Mine-Mill.

One cannot feel, however, that the red issue is a dead one. Unless this requirement is removed from the law during the coming session of Congress it will again come to the front when expiring contracts are discussed in mid-1949. It is worth noting that public sympathy in this matter has appeared to be on the side of the operator requiring compliance.

Information lately received, from usually reliable sources, is to the effect that the Communist Party has sent instructions to its good Party members that wherever possible they are to get out of non-essential industries and to establish themselves firmly in basic industries. One can only hope that the existing employment screening procedures are effective in eliminating this undesirable element at the "rustling line."

Fringe Issues Complicate Bargaining

The third round wage "pattern" during 1948 amounted to 12c per hour wage increase. This was originally established in the steel industry and first accepted in the mining industry by the Anaconda Copper Mining Co. whose contract expiration dates precede those generally existing. More significant, however, has been the contractual agreement by one of the "gas belt" smelters to arbitrate wages in event the operating organization could not agree with the union when the wage question was opened. The union's insistence upon the following of "patterns" makes this an extremely hazardous practice, for at any period an individual operator may set off the fourth, fifth, or sixth round of wage increases which will bear no relationship to many operation's ability to pay. A fourth round increase was established by one of these smelters after the arbitrator awarded a 13½c per hour increase. Indications are that this is already establishing a "pattern" for the zinc smelters in the gas belt.

The matter of "sick leave" has been a relatively new entrant into the contracts of some companies. There exist two schools of thought relative to the advisability of such phases of labor-management relationship. It is worth noting, however, that some of those organizations which have adopted such plans report excellent cooperation from the unions and feel that it is a most beneficial thing in the way of a "fringe issue" granted.

Labor-Management Relations "Grow Up" Under 1947 Act

From many quarters comes the word that the existence of the Labor-Management Relations Act of 1947 has had a good effect insofar as the mechanics of bargaining are concerned. Reports are to the effect that labor and management representatives have both acted in a more mature manner in their deliberations of 1948 contract problems.

Labor reports that supervisors are becoming increasingly aware of their responsibilities and limitations under the law. Grievances appear to be handled more amicably with due recognition being given to the personalities of the individuals concerned. One labor leader attributes this trend to the fact that the technical graduates of today are better equipped to deal with individuals as individuals; another says that he feels this condition has naturally risen because the boss realizes that grievances cannot be typed or classified according to any single set of standards. There is no question in the writer's mind that the educational programs are beginning to pay off—not only will trained supervisors be better supervisors but they are getting valuable managerial experience. Whatever the answer, the result seems to indicate a warmer relationship.

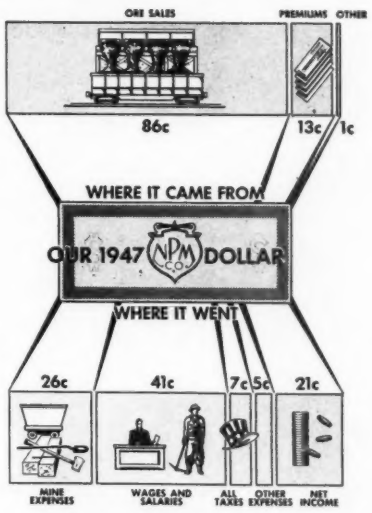
Mine-Mill's principal publication,

"The Union," has had the tragic effect of building a wide gulf between an employer and his employe. This publication, in occasional issues, might disgust an intelligent employe but through its regularity he becomes aware of indications of racial, religious, and social slights—he searches for them and finds them and magnifies them—they become real. Where this type of material has been an employe's basic source of information one cannot expect a shift in thinking overnight. Many companies have embarked upon programs of publishing plant information—some report disappointment, but it is felt that in those cases they have expected, immediately, to overcome deep-seated prejudice. The change-over can never be expected unless a long range plan is adopted and a fair and realistic policy of presenting, in readable language, the facts of life insofar as an employe's immediate economic interest lies. Some unions are doing a truthful reporting job for they recognize the need of truth if the realities of trade unionism aren't to be usurped by the warped thinking of idealistic crackpots. They further appreciate the fact that the members' jobs become more secure through entrenching, in the mind of their members, an understanding and appreciation of the "American way."

Company Publications Improve Relations

The annual reports of many companies are good illustrations of the term "readable language." Inquiry among employes will reveal the existence of a deep-seated opinion that companies ordinarily print two reports—one for their stockholders and one for the public consumption. Their conviction goes to the point of flat statements that the two sets of figures don't jibe. The New Park Mining Co. has, for the past two years, received national acclaim for their presentation of fiscal facts to both the stockholder and the employe. And the figures do jibe! Unfortunately too many people think of the annual report as an unnecessary expense and that elaboration on detail and widespread distribution of these facts are dangerous. Actually it is the mystery of the normal report that breeds danger and suspicion.

Many mining operators have availed themselves, during the past year, of the "free speech" rights granted by the L-M Act and have presented the first honest picture of management that many employes have ever seen. Many of these presentations have been most effective in that employe response has been normal in every respect. One cannot help feeling it necessary to caution those who would exercise this right and misrepresent facts that they are treading upon dangerous ground. Untruths, when recognized, can only instill in the recipients a lack of confidence in all future managerial statements and actions.



NEW PARK MINING COMPANY

STATEMENT OF INCOME FOR THE YEAR ENDED DECEMBER 31, 1947

INCOME FROM ORE SALES:		
Gross smelter settlements	$1,840,744.90	
Less: Treatment charges, freight, and other smelter deductions	222,330.07	
Net smelter settlement		$1,618,414.83
Add: Metal Premiums		242,896.97
INCOME FROM ORE SALES		1,861,311.80
COST OF MINING AND OTHER EXPENSES:		
Cost of mining	1,116,720.01	
Provision for depreciation	54,603.17	
General and administrative expenses	107,254.14	
Taxes—other than federal income taxes	51,193.83	
Leased and other property expenses	1,564.48	
		1,331,335.63
INCOME FROM MINING		529,976.17
OTHER INCOME:		
Profit from sale of investments and other assets	5,137.03	
Bond interest, bus income, and miscellaneous income	8,327.15	
		13,464.18
		543,440.35
OTHER EXPENSES AND LOSSES:		
Intangible drilling costs—oil operations	56,259.26	
Abandonment of proposed mill construction	8,185.00	
Miscellaneous expenses and losses	618.44	
		65,062.70
INCOME BEFORE PROVISION FOR FEDERAL INCOME TAXES		478,397.65
PROVISION FOR FEDERAL INCOME TAXES		80,424.84
NET INCOME FOR THE YEAR ENDED DECEMBER 31, 1947, WITHOUT PROVISION FOR DEPLETION		$ 397,972.81

Clear company reports make for better understanding

Employment Matters—Ad Infinitum

When the Supreme Court recently held that "pension plans," "merit increases," and similar matters were within the scope of collective bargaining, mining operators thought the ultimate had been reached. The field of collective bargaining, however, has now been expanded to "any matter reasonably related to their employment."

This significant development results from the refusal of the Supreme Court to review the decision of the 7th Circuit Court of Appeals in the case of NLRB vs Phoenix Mutual Life Insurance Co. A group of salesmen of the insurance company were dissatisfied with the cashier in the branch office out of which they worked. It was conceded that the cashier's efficiency or lack of efficiency was important to the salesmen, since the cashier furnished them with rates, dividend earnings, and other important information relative to policies. The company discharged the cashier, whereupon the salesmen decided to make recommendations relative to the selection of the new cashier. Two of their number were selected by the group to prepare a letter to the company. Hearing of this, the company discharged the two salesmen. Their letter of discharge said:

> "Your recent actions and involvement in the resignation and new appointment affecting our cashier's department have been so far beyond the premise of your responsibility, and so completely unpleasant, that in full agreement with the home office we are cancelling your agent's contract effective thirty days from today."

The NLRB held the salesmen had the right, under the Act, to take up with their employer "any matter reasonably related to their employment"; that their discharge constituted an unfair labor practice, and ordered the company to reinstate them. The court sustained the Board.

These salesmen were unorganized. No union was involved here. The effect of this decision is that any group of employes, whether organized or not, is entitled to take up with management—and management is obligated to discuss with them—"any matter reasonably related to their employment." It opens the whole limitless field of nonunion grievances.

On November 15, the Supreme Court decided, in effect, that Congress had acted legally when it voided workers' claims for some $6 billion in retroactive "portal to portal" pay. This ruling did not involve the constitutionality of the entire act but upheld the validity of the major portion of it—that banning retroactive pay claims.

Road Ahead Is Long—Need Not Be Rough

There exists, in the nonferrous metal mining industry, a large segment of employers whose entire philosophy of labor-management relationships is unrealistic and impractical. This is best demonstrated by the presence, at the top of operating organizations, of men who sincerely believe that trade unionism is a passing phase. The truth is that there does not exist, today, one iota of objective evidence to support that conclusion—

Training programs result in more efficient miners

in fact, a searching inquiry reveals exactly the opposite. Union membership, today, is at historical highs and the presence of splits between left and right wing segments is in no way indicative of weakness; rather, it betokens the strength of true trade unionism when placed alongside foreign ideologies. Logical thinking develops the opinion that future demands of right wing segments must be as aggressive as any previously presented by radical elements if the new groups are to hold their strength.

There continues to be present, in corporate makeup, the failure to appreciate the fact that its most outstanding cost item is LABOR. And, in many cases, that cost item is dealt with by untrained and inexperienced personnel. Management, invariably, uses highly trained and experienced personnel in the handling of relatively unimportant technological cost details! Where, in some cases, experience is available, the labor relations man is often completely dominated and overshadowed by outmoded and shopworn policies which defeat the objective of harmonious labor-management relationships. Almost without exception, operating companies which have barred legal "talent" from actual contract negotiations report an earlier and more amicable agreement. This does not imply that the legal staff of either the union or the employer fails to couch the contract terms—the opposite is true. The big thing is that suspicion and acrimony are minimized—the employe knows what he wants and the employer knows what it is possible to give. When both understand each another, insofar as terminology is concerned, a contract becomes the instrument and is easier to live with and less likely of future misinterpretation.

Unfortunately there has been no panacea developed for our labor ills during 1948. It is suspected (without use of a crystal ball) that the most significant development in the entire field transpired on November 2, 1948. Labor, in many respects, made good its threat to defeat those congressmen who had voted for the L-M Act—those elected are, largely, pledged to repeal the Act. Labor recognizes the fact, however, that the general public originally asked for such legislation and can ask for it again. This possibility may temper their demands upon the new Congress. No one can suggest, however, that we are not about to embark upon a new phase in the labor field at the opening of the 81st Congress.

Irrespective of the workings of Congress it is high time we all learned that which the sales manager and his men have known for so long—you can't hate the customer without the customer hating you. The same applies to labor. In this vast field of human relationships there is room for human understanding, sympathy, and mutual respect. Management and labor must cultivate and practice those attributes if industrial peace is to become entrenched through mutual desire rather than through the process of pitting one group against the other in legal strife.

Anthracite

(*Continued from page* 87)

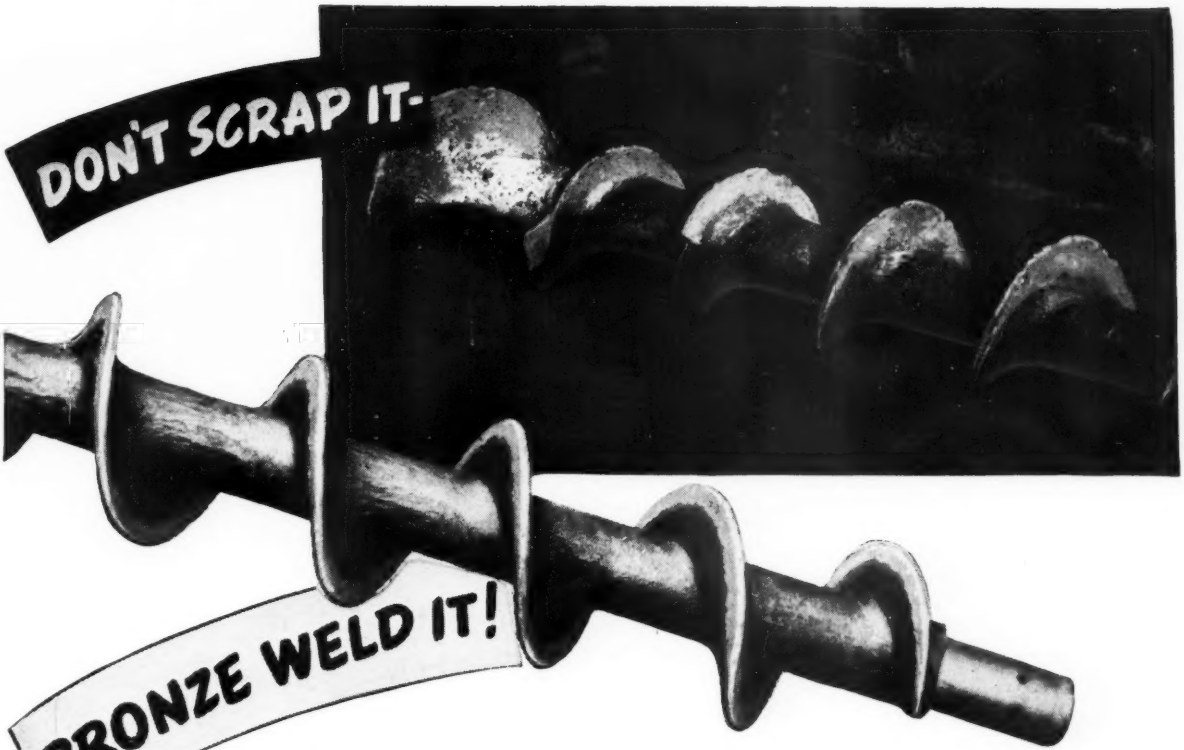
promotion of new developments in all phases of the industry.

Improved Employe Relations

In addition to the progress made in research activities and operating facilities, the industry has done much during the year to improve the employer-employe relationships. The problems confronting the industry have been conveyed to the employes by various means and sincere attempts are being made by both labor and management to work together for mutual benefit.

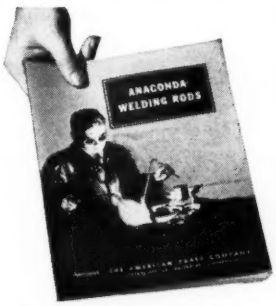
Steps were also taken to make foremen a more integral part of management by conducting foremen training programs and conferences of various kinds. One of the larger companies recently announced a new pension plan for monthly employes providing benefits as large or larger than those granted the union employes.

Increased business should result in the future as a result of developments for new uses of anthracite, increased demand of anthracite for steam generation power plants, more favorable public opinion, developments in efficient automatic anthracite burning equipment, and changes in competitive fuel supply and price situations. However, the anthracite industry must overcome the serious problem of producing an adequate and unfailing supply of coal at a lower price by improving operating efficiency. If this is done, along with an active development and distribution program of modern anthracite burning equipment, supplemented by the necessary service, the industry will capitalize to the fullest on the opportunities now presenting themselves.



Build up worn surfaces *quickly* . . . at a fraction of replacement cost

Here's the answer to how, when and why . . .



The American Brass Company pioneered in the development of Bronze Welding and has a suitable rod for many oxy-acetylene and arc welding purposes. Anaconda Publication B-13 describes these rods and suggests procedures for their use. A copy is yours for the asking.

It's hard to imagine any kind of industrial equipment taking a worse beating than a spiral feed screw. Under tons of wet coal or in a hot ash pit, corrosive and abrasive action are ever-present. To a well known mid-western railroad shop, continual replacement because of worn outer edges proved not only too expensive but unnecessary. Bronze Surfacing was found to be fast—and far more economical.

Welding rods such as "997" Low-Fuming and Tobin Bronze* are extensively used with the oxy-acetylene torch to deposit high strength, dense and tough weld metal on cast iron, malleable iron, steel and copper alloys. By this building-up process many shops are daily saving countless dollars by reclaiming worn parts and industrial equipment:—Sheaves, pulleys, bushings and bearings, pistons, impellers and pump parts, stripped threads and broken gear teeth, thrust plates, hubs, flanges, parts machined undersize, etc.

In addition, low temperature Bronze Welding offers a ready means of repairing broken or fractured production equipment and machine tools. Next time, "Don't Scrap It—Bronze Weld It!"

*Reg. U. S. Pat. Off.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut • Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

47127

ANACONDA
from mine to consumer

Anaconda Bronze Welding Rods

HEAVY-MEDIA SEPARATION

The Giant that Grew Over Night

Ready *NOW* to Help You Ship "Buyers-Market Quality" Coal

1949 is the year! Heavy-Media Separation is the process!

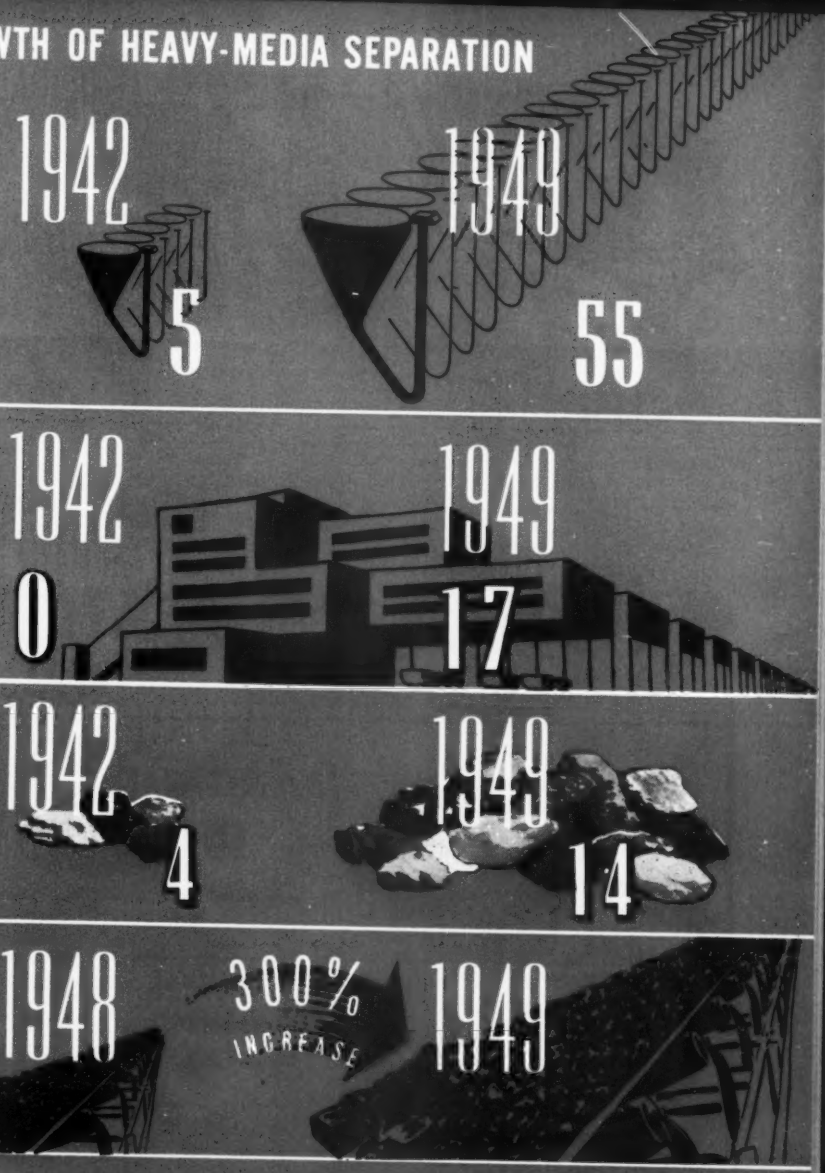
From here on in, only low-cost mining plus high-capacity precision cleaning can keep your coal competitive on ash, sulphur *and* price!

That means far more than mere sizing, water-washing and removal of visible slate. It means infallible separation of "pre-determined specification" coal even from near-gravity refuse by reason of the slightest difference in their specific gravities. *It means Heavy-Media Separation, the only coal cleaning process that closely duplicates "heavy liquid" results over a full size-range at any gravity from 1.25 to 3.75 . . . the only coal cleaning process that can provide automatic, continuous and complete removal of large and variable amounts of refuse without volumetric limitation.*

The proof of a process is its adoption by leading producers. As each new Heavy-Media preparation plant turns over, additional proof steadily accumulates to show that:

Heavy-Media Separation makes an amazingly sharp separation . . . maintains the desired separating gravity within ± 0.01 . . . never changes its separating efficiency because of intermittent feed or a sudden increase in the refuse content of raw coal. No other process even closely approximates its combination of efficiency and range of applicability!

THE REMARKABLE GROWTH OF HEAVY-MEDIA SEPARATION



1949 is the year!

Cyanamid offers a complete range of Separation Processes by Specific Gravity Difference (Heavy-Media Separation and the Dutch State Mines Cyclone Separator) for new cleaning plants or as adjuncts to present washers.

Prefabricated Heavy-Media plants with capacities up to 125 tons per hour are available for prompt delivery and speedy erection. Larger Heavy-Media units can be quickly designed through the accumulated experience of several well-known engineering firms.

With no self-interest in equipment manufacture or plant construction, Cyanamid can give you sound counsel based on unprejudiced tests in the Cyanamid Mineral Dressing Laboratory and Pilot Plant at Stamford, Conn. We will also cooperate with engineers of your choice on plant design and provide a Cyanamid Field Engineer to tune-up your Heavy-Media or Cyclone Separator unit. Your inquiry is invited.

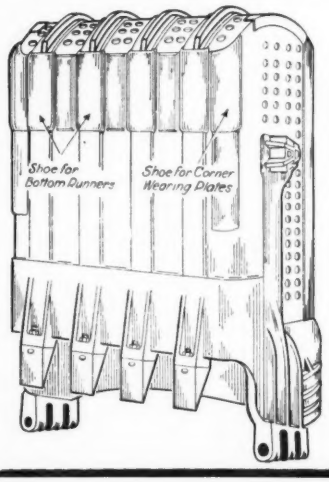
AMERICAN Cyanamid COMPANY

MINERAL DRESSING DIVISION

30 ROCKEFELLER PLAZA NEW YORK 20, NEW YORK

COAL STRIPPING

WITH LOW MAINTENANCE



DETAILS OF CAST STEEL MANGANESE WEARING SHOES FOR TYPE "HS" BUCKETS

To your left is a detailed drawing of the Type "HS" Bucket showing the easily renewable Manganese Steel Shoes for the bottom runners and corner wearing plates . . . those parts which take the brunt of abuse. Renewable shoes are standard equipment on all Hendrix Type "HS" Buckets.

3/8 to 40 Cu. Yds. WITH OR WITHOUT PERFORATIONS

See our exhibit at The Coal Convention and Exposition in Cleveland May 9 through May 12, 1949

HERE'S WHY!

Bucket maintenance costs take a tumble when you use a Hendrix "HS" in your coal stripping operations. The renewable shoes allow you to replace those parts which take the most abuse right on the job. Another important feature is the failure-proof ARCH of rugged box-section construction whose ability to "take it" results in less loss of time and increased production on every job!

HENDRIX *Lightweight* **DRAGLINE BUCKETS**

HENDRIX MANUFACTURING CO., INC.

MANSFIELD — LOUISIANA

Mineral Economics in 1948

Buffeted by High Costs, Wages, and Taxes, Industry Strives to Supply Demand

By PAUL M. TYLER
Consulting Mineral Technologist and Economist
Washington, D. C.

LONG TERM trends in the mineral industries were still distorted in 1948 by conditions which the voice of experience characterizes as strictly abnormal. Some of the new forces will doubtless modify the final postwar pattern. Others have already abated. Traditionally, raw materials are the first to feel the impact of a recession but as minerals become progressively more essential to modern ways of living they are likely to resist a down swing in general business and lead a new advance. During the postwar boom the demand for mineral products has seemed insatiable and in the long-awaited economic readjustment—whatever its magnitude of timing may be—nonferrous metals in particular occupy a preferred position. Increased per capita consumption—due to mechanization and other well-known factors—forecasts a faster increase in industrial world demand than indicated by the barometer of rapid population growth while military needs and Government stockpiling assure market support for years to come.

Despite serious work interruptions and rising costs, world production of almost all mineral products (except perhaps tin and lead) has been well maintained. In 1948 it was in most cases not far below wartime peak and close to or above prewar top-levels yet never enough to bridge the wide gap between supply and demand. Even though consumption may be leveling off in the United States it is rising abroad. Whereas industrial activity remains subnormal in Austria, Greece, and Italy, as well as in Germany and Japan, many foreign countries required more mineral raw materials to feed their booming industries last year than ever before.

Although the mining industry has deplored price advances even when occasioned by wage increases and the general rise in operating costs, its earnings have been boosted by volume production. The profits shown in year-end statements of low cost producers, however, must be discounted in terms of what inflated dollars will buy. Depletion and depreciation accounts likewise bear watching in the light of changed conditions.

The Dear, Dead Past

Those of us who embarked on mining careers just before the first world war used to think in terms of 14c copper, 4c lead, 5c zinc (spelter, we called it), 50c silver, and gold forever established at $20.67. Nickel was pegged nominally at 35c. Despite violent fluctuations, tin averaged around 40c and antimony seemed to have settled down at about 8c or 9c a pound. The price of non-Bessemer iron ores was around $3 a long ton at lower lake ports and bituminous coal averaged (1913), $1.18 a short ton fob U.S. mines.

Against this background present day prices appear fantastically high. But so is everything else. On frosty mornings a crusty old lawyer habitually challenged any chance remark by his colleagues as to the day being cold by the query "Cold to you or to a polar bear?" Actually, in comparison with many other commodities and in view of increased handicaps of mining, minerals are still relatively cheap.

In the 1910-14 period, miners and muckers were getting $3.50 for an 8-hour shift in a few "high-priced" western camps. You went down on company time but came up on your own time and changed your wet clothes in a smelly dry. At a small copper-pyrite mine in eastern Canada, where this author worked one summer, the wage scale was $1.50 for ten hours underground but good board, a clean bed, and "washing" cost only $14 a month and a satisfying supper—plenty of beans and bread, fair coffee and a slab of pie—cost 15c, and no tip. Down South, miners often worked for $1 a day and the day stretched from dawn to dark. In Arizona and Colorado, while the big mines paid $3 or even $3.50 for underground labor, "leasers" sometimes paid much less and across the line in Sonora the scale was about the same in local pesos worth generally a good deal less than par. Western American bars served a large glass of beer without too much suds for a nickel and a shot of hard liquor for a "bit," occasionally for a dime. Common labor in Pittsburgh steel mills got 16c an hour during a heart-breaking 12-hour shift and average pay and working conditions at nonferrous smelters and refineries were quite different than they are today. Again drawing upon personal recollections, the author worked the summer of 1912 as a smelter laborer at Copper Cliff at wages ranging from 16c to a top figure of 22c an hour (11-hour days, 13-hour nights), then taught chemistry at MIT for $62.50 a

Mechanical equipment handles mine products en route to smelters, mills, and factories

month and finally captured a mining engineer job in Mexico at the then munificent salary of $100 (gold) a month.

The statistical picture shows the same story. The records afford no evidence that metal consumers had been gouged. Metal prices have increased more than the average for all commodities, but not much more. The Bureau of Labor Statistics index of wholesale prices of all commodities in September 1948, was 2.2 times the 1939 average. However, all raw materials were 2.7 times prewar prices while manufactured goods had only doubled. Nonferrous metal prices, as measured by the weighted index of the *Engineering and Mining Journal*, lagged behind the general trend and were not quite twice prewar in December 1947 but rose steadily thereafter until in November 1948 they were 2.4 times prewar. Farm products on the average, trebled in price after 1939.

Short Supply Causes Substitution

Consumer resistance to the constant upsurge in metal prices has thus far been negligible. Such substitutions as have occurred can be attributed to short supplies rather than to high prices, but they may be portentous nevertheless. It might be argued that the tremendously expanded sales of light metals, much greater than most observers anticipated, are supplementary rather than competitive. On the other hand, markets once invaded are often lost permanently. Manufacturers of all kinds of product turned inevitably to aluminum when they could not get steel or copper even when price ratios were unfavorable. Later as aluminum prices held firm or advanced only a trifling amount in comparison with sharp advances in older metals the competitive position of aluminum improved. Competition has been limited by a shortage of cheap power for making more aluminum but the long range situation presents an interesting problem in market analysis. Other areas of the interproduct competition are being watched by most metal producers with more and more apprehension after each jump in price. Although fabricators so far have been able to absorb these price increases, or pass them on to ultimate consumers, the violent changes in prices of several metals relative to one another and competitive materials promise to upset former practices and customs.

Liquid and gaseous fuels continued to invade traditional markets for solid fuels. In certain areas the encroachment of natural gas in particular would have been substantially greater had steel been available for new pipe lines.

At least one large metal-using concern has begun thinking in terms of ultimate supply as well as price. Product designs may be altered to fit an appraisal of future availability of raw material. This viewpoint may be influenced by groundless fears of early exhaustion of mineral supplies in the United States or even in our planet. On the other hand, those who do not share the fallacious conclusions of the "Have-Nots" may find sound reasons for revising future thinking so as to take account of relative availability as well as probable prices of essential materials. This is one of the great lessons of experience during and after the recent war.

Wages and Costs Plague Planning

In almost every branch of mining wages remain the largest single item of cost. Spear-headed by concessions to coal miners, the financial status and welfare of workers in all domestic mines have improved. And operators pay the bills. Early in 1948 there was a good deal of talk about "holding the line" against wage increases. But after workers in the most of the large mass production industries received advances, the bars came down and wages and prices resumed their leap-frog progression toward still another round. According to the Monthly Labor Review, hourly rates have more than doubled in all branches of the industry since 1939. Steady employment and some increase in weekly hours have resulted in an even greater increase in take-home pay whereas the increase in the cost of living is calculated at only 70 to 75 percent. In rural areas, especially in the south, present wages are three to five times prewar and may be bolstered by a revision of the minimum 40c rate under the Fair Labor Standards Act of 1938. In the coal mines, contributions by the operators to welfare and retirement funds seem to be firmly established. And throughout the industry concessions in regard to working conditions, vacation pay, sick benefits, travel time, lunch periods, and other direct and indirect benefits are the order of the day. The Taft-Hartley Act and other curbs on labor's bargaining powers were under fire in the recent election campaign.

The President's Midyear Economic Report to Congress on July 21, 1947 bravely stated that "wage increases should be related to general trends in productivity and not made on a basis which forces price increases or prevents price reductions needed to assure sales of increasing supplies." Price increases caused by wage increases have recently been possible without impairing immediate sales outlets but it is generally believed that wage advances have discounted improved technology for years to come. The copper mine wage boost of 12c an hour in 1948, for example, was estimated as equivalent to 1¼ to 1½c per pound of metal. Rough comparisons between mine production and employment statistics indicate new high records in ore output per man-hour in copper mines (following an earlier postwar letdown) and some improvement in other branches of mining, but throughout the industry labor costs seem to have increased almost as much as hourly wage rates. Notable exceptions to this general rule may be cited and, with mechanization proceeding at an accelerated rate, over-all efficiency at large mines promises to improve fairly rapidly. New mining machinery, notably the continuous coal mining equipment, promises to economize still further on manpower.

Never before has the mining industry been so well provided with modern productive facilities, and present high earnings are being plowed back into the business to make them still better. Treatment plants as well as mine equipment had to be largely rehabilitated and modernized after the war, in some cases rebuilt. This program although still incomplete is well advanced. An occasional old mine has been reactivated and a number of large new mining projects—witness the mass mining at Butte and the new Arizona copper enterprise—have been initiated. The complete list of new mines and districts discovered or reopened in recent years belies the earlier forecast of pessimistic observers of the mining scene, as well as the limping stock market.

The plight of the small miner, however, shows no signs of growing permanently better. Replacement of hand labor by machines and the adoption of cost-reducing methods of mass mining and cheap milling are not so readily accomplished at smaller mines. Even when capital is obtainable for these improvements, the configuration of deposits or the tonnage of ore in sight often does not justify the outlay.

Relief Measures—Tax Relief Needed

Even in this present era of unparalleled prosperity, forward-looking persons have been thinking about the future. The trend of much of this thinking has been summarized by Senator Malone, an active champion of the mining industry of the west. He claims that there are five main handicaps which hold back mining: (1) unwise taxes; (2) the Securities and Exchange Commission's brakes on investment; (3) tariff reduction; (4) the "have-not" atmosphere in Washington; and (5) the Munitions Board's policy of buying foreign minerals. Many observers point out that the common stockholder who

provides the risk capital not alone for mining but also for other business enterprises has become the "forgotten man" in the postwar readjustments. Such dividends as he gets from his holdings are double taxed, first as company profits and then as personal income. There is talk again of reviving excess profits taxes on corporations. In the mining industry this means reduction in the funds available to mining companies for plowing back into the business so as to expand operations and to find new mines. On the other hand, tax relief is being considered as a means of stimulating mining—possibly along the lines of the Canadian law of 1946 which exempts new base and precious metal mines and industrial mineral operations from all income taxes for three years, allows accelerated writing off of all capital expenditures, and permits charging certain classes of development costs against operating expenses.

The controversy over tariffs and subsidies still rages. So long as supplies are short, however, prices of most metals and minerals are likely to remain well above the minimum levels that have previously been deemed necessary to maintain and expand domestic industry. For this reason there has been no real opportunity as yet to evaluate the impact of the Geneva tariff cuts and the broad trend to lower all international trade barriers. Many observers feel nevertheless that the domestic quicksilver industry has already been "ruined," tungsten mining discouraged, and investment in other kinds of mining confused by actually or potentially easier importations. Admittedly, world trade is a two-way street. The hard fact, however, is that large imports almost invariably displace domestic goods or use up purchasing power which otherwise might be spent for American goods. Several mineral industries are especially vulnerable. Since 1934 when the Reciprocal Trade Agreement Act was adopted the United States wrote trade pacts with 41 nations and made additional concessions at the Geneva Conference in 1947. Last year this program was extended for one year, not long enough for business planning but leaving the door open for cutting down trade barriers among 54 nations as contemplated in the Charter of the International Trade Organization. This charter was authored by American representatives.

Subsidies, long resisted as contrary to American principles, have also been in the limelight. Several bills were presented to Congress but failed to pass. Most of them called for resumption of the Premium Price Plan with incentive payments for prospecting and new conservational features added. As the importance of minerals becomes more widely recognized, the point has been advanced that our national security would be fortified by spending public money in helping production. Mining men, however, are sharply divided on the subject of direct subsidies. Opinion of many operators is opposed to any plan that involves constant, intimate supervision by Government. Another group feel that some kind of aid is badly needed; if tariffs cannot be depended upon, they want subsidies.

Fuel for the world's greatest industrial nation

Stockpiling Lags

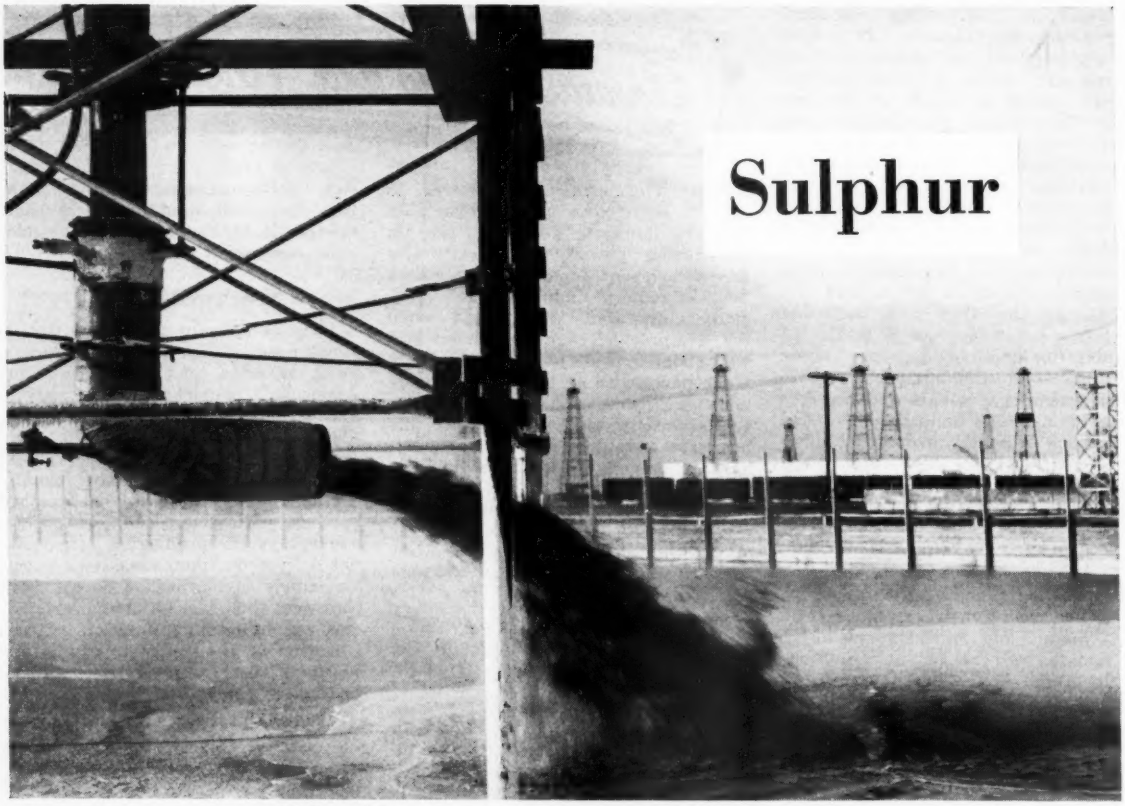
Various subsidy plans are tied to stockpiling. Government procurement agencies tend to ignore "Buy American" policies whenever assistance to domestic mines seems to conflict with their more immediate objective. When foreign minerals are cheaper than domestic their usually limited funds can thereby be stretched further. Moreover, contractors who are not yet in production often cannot deliver on time, sometimes never, and funds earmarked on development contracts thus become unavailable for spot purchases. The relation between Government assistance to mines and national security often needs clarification.

The present five-year military stockpiling plan calls for only the barest minimum need for possible war. It must be supplemented by a rising rather than a falling rate of domestic production. Total demand keeps on growing. Actual purchases under the present plan have fallen short of expectations because the desired tonnages cannot be easily diverted from normal trade channels. According to a recent report, the program is only 25 percent completed and the variety of materials obtained or "in sight" is badly out of balance with over-all requirements. So long as a more aggressive buying policy would aggravate the already critical shortages of material for essential current industrial and national defense production, sober judgment is needed to determine which needs come first.

In July 1948, a new division was organized in the Economic Cooperation Administration under Evan Just to help stimulate production of strategic material in Marshall Plan countries and channel supplies into the American stockpile or other gaps in our economy. This is the only ECA division responsible for obtaining any return for American aid. A possible by-product of importance is the creation of a more favorable political and economic climate for the investment of private capital in countries where American investors will now be placed on a more nearly equal footing with the nationals of those countries.

Priority and allocation controls, similar to those developed during the

(*Continued on page* 109)



Sulphur

Molten sulphur pours into a storage vat at the Hoskins Mound mine

Demand Surpasses Peak Output—Production from Refinery Gases Will Add to Future Supply

By R. KIRBY SHIRLEY
Executive Vice-President
Freeport Sulphur Co.

THE AMERICAN sulphur industry in 1948 mined approximately 4,800,000 long tons of sulphur to establish a new production record in the history of the industry. The largest amount produced in any previous year was 4,425,000 tons mined in 1947.

This production of elemental sulphur, or brimstone, came from seven mines along the Gulf Coast of Texas and Louisiana. These seven mines were operated by four companies—Texas Gulf Sulphur Co., Freeport Sulphur Co., Duval Sulphur Co., and Jefferson Lake Sulphur Co. One of the seven, the Moss Bluff mine of Texas Gulf, was a new mine opened during the year.

Production was maintained at a relatively stable over-all rate throughout the 12 months. The monthly output never varied by more than about 20,000 tons from the 400,000-ton mark. It fell slightly below this mark in the early months of the year, exceeded it somewhat during the summer, and was at or above it in the closing months.

The record output of sulphur in 1948 more than doubled prewar production. This output represented an increase over prewar years that was substantially greater than the gain in general industrial activity as measured by the Federal Reserve Board index. The 1948 sulphur production rate was 222 percent of the annual average for the 1935-39 period while the Federal Reserve Board index for 11 months of the year was 192 percent of this base.

Heavy Demand for Diversified Use

The demand for sulphur was so heavy that, despite the record output, shipments actually exceeded production. Shipments from the mines totalled approximately 5,000,000 long tons, a new record. The previous high was the 4,825,000 tons shipped in 1947. The excess of shipments over production was supplied by drawing upon above-ground stocks of mined sulphur. As a result, stocks at the mines declined to about 2,600,000 long tons at the end of the year.

Approximately 3,800,000 tons of the shipments went to domestic consumers within the United States. This enormous consumption of sulphur was due to continued high activity of sulphur-consuming industries and to further expansion of facilities utilizing sulphur. All of the major consuming industries operated at top levels. Another factor in the high demand was the fact that imports of pyrites, which supply part of the market for sulphur, have not returned to prewar levels.

The bulk of the sulphur consumed in the United States is converted first into sulphuric acid, and construction of new sulphuric acid plants increased total acid capacity substantially in 1948. These new plants brought the nation's actual acid capacity to an estimated 12,000,000 tons per year (100 percent basis). This figure is somewhat higher than the total rated plant capacity, as it has been found that many of the acid plants can be

operated, and are being operated, at above rated capacity.

Among individual industries consuming sulphur in its various forms, the fertilizer industry continued to use the largest amount, principally for the manufacture of superphosphates. The chemical industry, which uses sulphur in many forms for many purposes, and the petroleum industry, which uses sulphur in the form of sulphuric acid for refining operations, took large quantities. There was a further substantial increase in the consumption of sulphur to make carbon bisulphide for the rayon industry.

Other large users were the steel, paper, rubber, and paint and pigments industries. Sulphur consumption by the paper industry has not kept pace, however, with the expansion of total paper production, as most of the new production has been sulphate process paper, which requires less sulphur, and because of improved operating technique enabling economies in consumption.

In the field of new technical and technological developments, sulphur continued to show its traditional versatility. In past years, whenever changes occurred, this versatility usually has brought sulphur one or more new uses for every old use that was diminished or eliminated. During 1948, the versatility was demonstrated in a novel way in cotton insect control.

The new organic insecticides, such as DDT, benzene hexachloride, chlorinated camphene and chlordane, proved effective against major cotton insect pests but were found to destroy at the same time the natural enemies of a heretofore minor pest, the red spider. The red spider thus became a real problem. Research workers solved the problem by proving that the addition of dusting sulphur as a diluent for the organic chemicals would stop the red spider without materially affecting the price of the finished product.

Approximately 1,200,000 tons of shipments went to foreign markets. Of this total about 300,000 tons were sent to Canada, principally for the pulp and paper industry, and the remaining 900,000 tons were shipped to consumers abroad. A factor in the high consumption was the failure of pyrites producers in Spain to keep up with the demand. Consumers who otherwise would have used pyrites were forced to seek sulphur from the United States.

Competitive Sources Produce Elemental Sulphur

Increasing attention was devoted in 1948 to sulphur from sources other than the Gulf Coast deposits. Pyrites of course have always been an alternative to Gulf Coast brimstone for many sulphur users, but generally elemental sulphur was not recovered from the pyrites, these ores being used instead directly for the production of sulphuric acid. The recent developments centered on processes and plants for the recovery from various sources of elemental sulphur as such.

One of these sources is hydrogen sulphide from "sour" natural and refinery gases. Some sulphur has been obtained from such gases in the past few years, but in 1948 plans were made for four new plants which are expected to more than quadruple the previous output of this type. When these plants are in operation, the total production of elemental sulphur from hydrogen sulphide is expected to be in the neighborhood of 200,000 tons a year. Three of the new plants are to be in the West, and one on the East Coast. In addition, construction of other plants is being considered.

Another development was the experimental production by Noranda Mines Ltd. of elemental sulphur from pyrite tailings at its smelter in western Quebec. Noranda has large reserves of pyrite and for many years has produced 100,000 to 200,000 tons a year for use in the manufacture of sulphuric acid. Provided the economics are demonstrated in the present pilot plant, Noranda could supply a part of the Canadian market, which amounts to about 300,000 tons of sulphur a year.

Plans also were reported for the production of liquid sulphur dioxide by Canadian Industries Ltd. in connection with flash roasting of sulphide ores by International Nickel Co. at its Copper Cliff smelter in Ontario. If necessary installations are made, this project could supply liquid sulphur dioxide for a portion of the Canadian sulphur market.

A shovel loads sulphur from a stockpile at the Grande Ecaille mine

Looking Forward

The sulphur industry, having completed a record year, enters 1949 with production rates at about the peak level maintained in 1948. All seven mines are in full operation and prospects are good for high total production.

The demand for sulphur, which in 1948 outstripped the production of sulphur, continues to be great. As the new year begins, the domestic demand is at extremely high levels and indications are that the foreign demand will be even greater than in 1948.

—Aluminum—

Demand Continues High—Tight Supply Predicted for 1949

By DONALD M. WHITE
Secretary
The Aluminum Association

EVEN THOUGH about one and a quarter billion pounds of aluminum were produced in the United States during 1948, a slight increase over the 1947 production, the industry still was unable to meet the unprecedented demand that has developed since the war. It is estimated that at least half a billion pounds more of the lightweight metal could have been sold during the year if it could have been produced. The foregoing estimated total for the year is based on definite figures for the first 11 months aggregating 1,140,433,400 lb.

The outlook for 1949 is for an even tighter supply situation because no substantial new production facilities are in prospect and demand is still increasing. The metal needed for the nation's planned 70-group air force, which must take precedence over all civilian demands, will tighten the aluminum supply situation still further. In addition, imports from Canada to the United States will be greatly curtailed in the first half of 1949, according to recent announcements by Canadian producers. This curtailment is due to low-water conditions in Canada's hydroelectric plants.

Shipments of wrought aluminum products for 1948 aggregated more than a billion and a half pounds, based on definite figures for the first ten months. These include plate, sheet, and strip; structural shapes, rod, bar, and wire; extruded shapes, tube blooms, and tubing; and powder, flake, and paste. Sheet strip, and plate comprise a majority of the wrought products produced. Shipments of these items by member companies of The Aluminum Association, which account for more than 98 percent of the United States total, amounted to 1,168,474,800 lb for the first 11 months of the year.

Production of aluminum and aluminum alloy castings during 1948 totaled about 430,000,000 lb, approximately the same as during 1947. Permanent-mold castings comprised about 39 percent of the year's total, sand castings 32 percent, and die castings 27 percent.

Aluminum production cannot be increased above the present level unless more electric power becomes available. For every pound of metal produced, about ten kwhr of electric energy is consumed; electricity thus represents about 20 percent of the total cost of the metal.

Plans for a new reduction plant to be built in Texas were drawn up by the Aluminum Company of America during 1948. This plant will utilize natural gas from the Texas oil fields to produce the electric energy needed for its operation. It is not expected to be completed in time to relieve shortages to any great extent in 1949.

There are now more than 4000 uses for the metal, and the list is still growing. Aluminum is now the basic raw material for some 17,000 businesses in the United States employing about 1,000,000 people.

Building Industry Leads in Aluminum Use

One of the most significant developments of recent years has been the extent to which the building industry has come to use aluminum. This industry has used more of the metal than any other class of application since 1946, having displaced the transportation-equipment industry from first position during that year. Several aluminum houses have been built and exhibited in various parts of the United States.

Many new uses have been stimulated by wartime advances in aluminum alloys and in methods of fabrication. Since the war, producers have brought out new shapes especially adapted to the needs of the building industry. Shortages and inflated prices of other building materials also have stimulated the substitution of aluminum in many cases for the more traditional materials. Aluminum has proved so highly adaptable that many of these substitutions have become permanent.

Second only to the building industry, the transportation-equipment industry continues to use large quantities of aluminum. This is true of all types of transportation—air, land, and marine. Other large users of the metal in 1948 were the cooking-utensil manufacturers, who led the field for many years; the electrical industry; and manufacturers of industrial equipment of all types. The use of aluminum foil for wrapping various types of products, for decorative purposes, and for thermal insulation also increased during the year.

Industry Marks 60-Year Growth

The United States aluminum industry reached the age of 60 during 1948, and the event was marked by a special celebration held during the autumn meeting of The Aluminum Association in Pittsburgh. The ceremonies were held in a replica of portions of the original plant of the Pittsburgh Reduction Co., and the feature event was a reenactment of the pouring of the first ingot produced by the electrolytic process in 1888 by Arthur V. Davis, chairman of the board of Aluminum Company of America, in the same manner in which he and Charles Martin Hall, inventor of the process, poured the first ingot 60 years ago.

The development of aluminum to the full stature of a major, essential metal has come about in a spectacularly short time. However, even these 60 years cover a greater span than the period of the industry's most significant expansion, and the growth that has made aluminum an essential to many industries has had its most amazing development within the past decade.

World War II really revealed aluminum to the world. Although its many potentialities had been suspected, the terrible urgency of war forced their fulfillment and demonstrated the metal to be not only suitable but preferable for many new uses. Although production currently is below the peak reached during the war, it is still four times the average produced during the years 1936-39.

The current situation stands in sharp contrast to that prevailing 60 years ago when the industry was born. Initially, only about 50 lb of metal could be produced per day; but nobody wanted much even after the price was reduced to a new "low" of $2 a pound in half-ton lots. Today the industry produces about 3,500,000 lb a day.

Increasing wage rates and the mounting costs of all constituents entering into the production of the metal forced a moderate increase in price during 1948. This increase amounted to only 2c a pound for primary metal, from 14 to 16c for pig, leaving aluminum still the only metal to sell at a price considerably below its prewar figure.

Aluminum scrap was in heavy demand and in short supply during the entire year. As a result, metal processed from scrap, or so-called "secondary" metal, sold at rates somewhat

(*Continued on page* 114)

Domestic Silver Production Largest Since 1943

Domestic Output Rose in 1948—Demand for Coinage of Intrinsic Value Balks British Scheme to Substitute Cheaper Metals

By HON. PAT McCARRAN
U. S. Senator from Nevada

DOMESTIC PRODUCTION of silver in 1948 was 37,790,083 oz, as compared with 34,181,335 oz in 1947, an increase of 3,608,748. The largest monthly production in 1948 was 3,434,747 oz in April and the smallest 2,925,798 oz in December. Mexico, as usual, was the world's leading producer of silver in the past year with approximately 64,300,000 oz as against their 1947 production of 58,800,000 oz. Canada, the world's third leading producer, produced 15,600,000 oz in 1948 as against 11,700,000 oz in 1947.

Treasury acquisitions of silver in 1948 almost equalled the entire domestic production for the year for the first time since before World War II, all of this silver (except 228.79 oz) having been acquired at the new Treasury buying price of 90.5¢ per ounce, which remained above the New York price throughout 1948. The total amount acquired was 36,789,373.31 oz, or 98 percent of domestic production for the year. This was an increase over Treasury acquisitions in 1947, which amounted to 30,300,000 oz, or 84 percent of the domestic production of 36,100,000 oz.

During the year 70 percent of the 36,789,373.31 oz acquired was monetized. The percentage represents the Treasury buying price of 90.5¢ per ounce against the monetary price of $1.29 per ounce. Since the Treasury issues silver certificates only up to the amount paid to the producer of the silver, the remaining silver (the other 30 percent) is profit to the Government and is carried in the general fund of the Treasury at a value of approximately 50¢ an ounce, this being the over-all average cost of silver acquired by the Treasury. The silver carried at cost in the general fund is revalued when coined into silver coins at $1.29 an ounce and into subsidiary coinage at $1.38 an ounce. United States subsidiary coinage minted in 1948 amounted to $37,483,014.50. No silver dollars have been coined since 1935.

Silver coinage was executed by the United States Mints for Syria and Cuba during 1948; the Syrian coinage amounting to 3,000,000 50-piaster pieces and 4,000,000 25-piaster pieces which consumed 483,261 oz, and the Cuban coinage comprising 6,830,000 20-centavo pieces and 5,120,000 10-centavo pieces containing 1,358,530 oz.

The Treasury has not acquired any foreign silver since 1942. This fact is attributed chiefly to the refusal of the Treasury to bid for foreign silver at above 35¢ an ounce, and to the neglect of the Treasury to comply with the spirit of the Silver Purchase Act of 1934. Largely as a result of the Treasury policy of evading the purchase provisions of this Act since 1942, a policy conceived during the tenure of former secretary Henry Morgenthau, silver holdings of the Treasury have fallen significantly short of the quota assigned by the Act on the basis of one to three ratio in dollar value with gold. Nor has the alternative objective of the Act even been approached—that acquisitions would cease when the market price reached $1.29 an ounce.

WORLD PRODUCTION OF SILVER

	1948 Oz	1947 Oz
North America	121,634,000	113,191,000
South America	23,230,000	20,388,000
Europe	5,000,000	5,163,000
Asia	2,500,000	2,656,000
Africa	5,200,000	5,602,000
Oceania	9,000,000	9,782,000
Total	166,564,000	156,782,000

SILVER RECOVERED FROM SCRAP, JEWELRY, ETC.

	Oz
1943	44,112,863
1944	56,189,409
1945	58,360,767
1946	36,646,860
1947	27,866,359
1948	30,000,000 (est.)

Market Price of Silver

The New York price remained firm at 74⅝¢ per fine ounce for a period beginning in November 1947 through July 1948. Such a stable price situation had not obtained since before the late war, except during the period of controlled prices when silver remained at 71.11c. After July the price began slight fluctuations, and fell a fraction in August, the average for that month being 73.8¢ an ounce. It recovered in September to an average of 75.3¢, and in October climbed to a high of 77.5¢ an ounce on October 6, the average for the month being 77.2¢. However, towards the end of October a definite downward trend developed but the price became temporarily stable at 74.7¢ on October 29. The fall in price was resumed then and continued slowly throughout November. By the end of the first week in December it reached 70¢ an ounce, at which point it remained unchanged for the balance of the year. Fluctuations in the price structure in 1948 were not as great as in 1947, when the highest price was 84¢ in January and the lowest 59¾¢ in June.

It is interesting to reflect on the factors contributing to the fall in the price in August 1948, after it had

SILVER IN CIRCULATION

Silver dollars—	
1948	$162,427,895
1947	154,048,795
Increase	$8,379,100
Silver certificates—	
1948	$2,058,615,461
1947	2,039,203,800
Increase	$19,411,661
Subsidiary coin—	
1948	$946,460,745
1947	907,529,941
Increase	$38,930,804
Federal Reserve Notes—	
1947	$24,581,661,075
1948	23,916,656,440
Decrease	$665,004,635
Total money in circulation—	
1947	$28,867,631,567
1948	28,223,592,164
Decrease	$644,039,403

remained rigid for the previous nine months. Fluctuations in price due to indigenous factors of a seasonal nature in the silver market usually occur and make slight price changes easily understood. However, a more complex element is said to have been instrumental in depressing the price to 70¢ an ounce in December from a high of 77.5¢ only two months earlier. This decline was caused primarily by a sharp drop in the peso-dollar exchange rate which occurred on July 22, 1948. The Mexican Government announced it was cutting the peso loose from its pre-war rate of 4.85 pesos to the dollar. This step was taken after it became apparent that the various devices used since the end of the war to improve Mexico's balance of payments position and to stop the drain on her supply of dollars were unavailing. This move affected the silver market because Mexican producers could obtain more pesos from sales of silver in New York after the devaluation than before. Even though the New York price continued to fall, it was more profitable to ship more silver to New York than before devaluation so long as the percentage drop in the peso from 4.85 continued to be greater than the percentage fall in the New York price.

In addition, devaluation made it profitable to import into the United States and melt down Mexican coins of high silver content, about 1,500,000 oz of such silver coins having been imported. The effect on the New York price is obvious. It happens that the importation of these particular coins for remelting ceases to become profitable if the market price goes below 70¢ an ounce. This observation and the fact that the Bank of Mexico's buying price for silver for coinage and industrial purposes has been about 70¢ an ounce account in large measure for the stability at the 70¢ level that has obtained since early in December to the time this article is written (January 21, 1949).

The Bank of Mexico has an option on the entire output of silver mined in Mexico, and since that country is the world's leading producer it is apparent that any policy pursued by the Bank will have a pronounced influence on the world price of silver. So long as the Bank pursues a policy of supporting the price of silver near the 70¢ level, the New York market should remain near that figure in so far as the efficacy of Mexican influence is a potent factor. It is my hope that Mexico will not find it necessary to further devalue the peso and thereby lay the groundwork for a further decline in the price of foreign silver.

Britons Desire Coin of Intrinsic Value

The silver market in London followed price movements in New York throughout 1948. As the price rose to 77.5¢ in New York on October 6, the London price went to 47 pence, or 79.8¢ an ounce, which was highest for the year. Such was the situation throughout the year, the London price following the New York trend and always slightly above it. The year ended with the London price at 42.5 pence, or 71¼¢ an ounce, at which point it had remained since the New York price settled to 70¢ early in December. The price differential accounts for shipping costs to Britain. However, towards the end of the year prices differed at times by more than the cost of transportation. This was due to British agitation to free the London market from every individual price fluctuation in New York. The idea was to follow only broad price trends in New York.

The plan of the British Government to substitute cupro-nickel coins for silver, conceived in the fall of 1946, suffered a setback shortly thereafter and has not been successful. The plan was supposedly instigated by the British desire to repay her silver lend-lease debt to the United States amounting to 88,073,878.23 oz. None of this silver has been returned, nor are there any visible signs of repayment. Shortly after the enactment of the British Coinage Act of 1946 it became evident that the man on the street was not willing and with much justification, to part with silver coins having more intrinsic value than the new copper-nickel coins. Coin holdings of the Bank of England declined during the last ten weeks of 1947 from £2,139,000 to £262,000. Although the scheme calls for withdrawal of silver coins within five years from January 1947, the first 18 months of the program failed to yield as much as 10 percent of the quantity in circulation.

The British Government seems to have difficulty in understanding the attitude of that "strange band of people" (*The Economist*, January 10, 1948) who desire to hoard silver coins when cupro-nickel coins will buy just as much goods and services. Their Government would not dare hint that the silver coins contain value not to be found in any other money metal, except gold, in addition to the prevailing purchasing power, or face value. To do so would be construed as repudiation of policy that the British have harbored during their long-standing opposition to silver as money. I should say that the "strange band of people" tag would better fit those economists in the British Government who are so presumptious as to think that the man on the street will be hood-winked into believing that the purchasing power of the two different types of coins will *always* remain identical because the Government says so, which is one way of saying that a precious metal is no longer precious.

Indian Market Stable

In the Bombay market the price of silver was much more stable during 1948 than in the previous two years. Ever since the Indian ban on the importation of silver was imposed in March 1946 the price has remained, with a few exceptions, well above the equivalent of $1 an ounce. The ban still has a tendency to depress the New York price, since silver ordinarily that would be shipped to India finds its way into the New York market. When the ban is removed, shipments of silver now destined for New York will be diverted to India, where the insatiable desire for hoarding will always assert itself.

Generally, the price in Bombay fluctuated within a narrow range from $1.36 to $1.45 an ounce from April 1948 to the end of the year. The first three months of 1948 showed a somewhat more pronounced price movement with a high of $1.38 on January 5 to a low for the entire year of $1.16 on February 10, 1948. Following slight fluctuations in March the price steadied for the balance of the year. The stable situation in the Indian market is an encouraging sign.

The Government of India now has power to substitute nickel coins for silver coins as a result of an Order in Council issued in 1946. The program, like the one in the British Isles, is not making much headway because of India's traditional hoarding of silver coins, and is not likely to make any progress as long as the import ban remains. It has been said that, when the ban is lifted, the Indian people may be just as willing to hoard silver bullion as coins. Then the British-sponsored plan to fleece the Indian public out of the sound money they have been accustomed to for centuries may succeed, because conversion to nickel coins will be facilitated. However, I take issue with the foregoing British opinion because of the different characteristics of the Indian and the British citizen. The

British are experiencing difficulty with their new cupro-nickel coinage plan in their own country among people who are far more familiar with the complexities of money and finance and who are willing to submit to certain monetary experiments from time to time with a moderate degree of understanding. But the people of India are not so imbued. It, therefore, seems reasonable to assume that the Indian people will not surrender coins of time-proven value merely because more silver bullion becomes available for hoarding when the British people, being far more advanced, are unwilling to do so. Given an increased supply of bullion in India through the elimination of the import ban it will be a tougher job to sell an asinine theory of coin substitution to a people whose transactions have been conducted with silver coins for centuries than to a more educated British population which even yet will not accept such absurdity.

Lend-Lease Returns Lag

The only lend-lease silver that has been returned since the war, amounting to 261,333.33 fine ounces, came from Belgium. This represents the entire amount lend-leased to that country. The total silver lend-leased during the war was 410,814,344.19 oz, the amount still outstanding being 410,553,010.86 oz. The major portion of the remainder was sent to England (88,073,878.21 oz) and India (225,999.903.83 oz). Together these two countries received approximately 75 percent of the total. Great Britain underwrote India's lend-lease silver debt, but it is not clear whether or not the granting of India's independence may negate any such British commitment. The British plan of coin substitution was supposedly intended for the purpose of repaying this silver lend-lease debt. (British silver coinage in circulation is estimated to comprise between 220,000,000 and 250,000,000 oz of fine silver.)

INTERNATIONAL SILVER MOVEMENT

Exports	Oz	Imports	Oz
Ore and base bullion—		Ore and base bullion—	
1948	4,151	1948	33,976,092
1947	None	1947	30,300,000
Refined bullion—		Refined bullion—	
1948	1,277,216	1948	48,579,073
1947	29,300,000	1947	53,900,000
U. S. Coin—		U. S. coin—	
1948	$567,000	1948	$2,423,197
Foreign coin—		Foreign coin—	
1948	$10,871,279	1948	$5,789,788

Belgium Coins Silver

According to the *Financial Times* of October 13, 1948, Belgium is busy minting new silver coins to replace coins withdrawn from circulation earlier in the year. Belgian authorities are minting 1,250,000,000 Belgian francs ($28,625,000) in silver coins. The new coinage pieces of 50 and 100 francs are being minted from metal recovered from old 20 and 50 franc pieces withdrawn from circulation.

International Monetary Fund

The Annual Report of the International Monetary Fund dated April 30, 1948, states that data on silver and its uses requested of member countries at Second Annual meeting pursuant to Resolution No. 3 (adopted at the First Annual Meeting) was not submitted by a sufficient number of members on March 1, 1948, the deadline. The Fund thereby notified the members that the report on silver would be delayed.

In the meantime some of the delinquent members submitted data and the report was presented to the Board of Governors at its annual meeting in September 1948. Although the report has not been made public, it is not expected to contain any recommendations favorable to silver as money. I shall examine this report fully at a later date.

Domestic Consumption Rises

The domestic consumption of silver in 1948 increased over the high level obtained in 1947. Approximately 110,000,000 oz were consumed by the various silver using industries as compared with 1947 consumption of 100,000,000 oz. The silverware industry took approximately 65,000,000 oz of the 1948 total. The new peak in consumption in this line is largely attributable to the postwar increase in the marriage rate. It is estimated that silver for photographic uses amounted to 16,500,000 oz in 1948, with the remainder, about 28,500,000 oz being consumed in the electrical field, jewelry, household appliances, oil burners, automobiles, bearings, etc. Most of the silver consumed industrially was of foreign origin, although silver recovered from scrap, old jewelry, trinkets, etc., probably amounted to 30,000,000 oz in 1948. Since the imports available to industry amounted to only 88,000,000 oz, industry was compelled to depend upon scrap silver for the balance of its requirements because the entire domestic production was acquired by the Treasury. It is expected that the heavy industrial demand will continue into 1949.

Mineral Economies

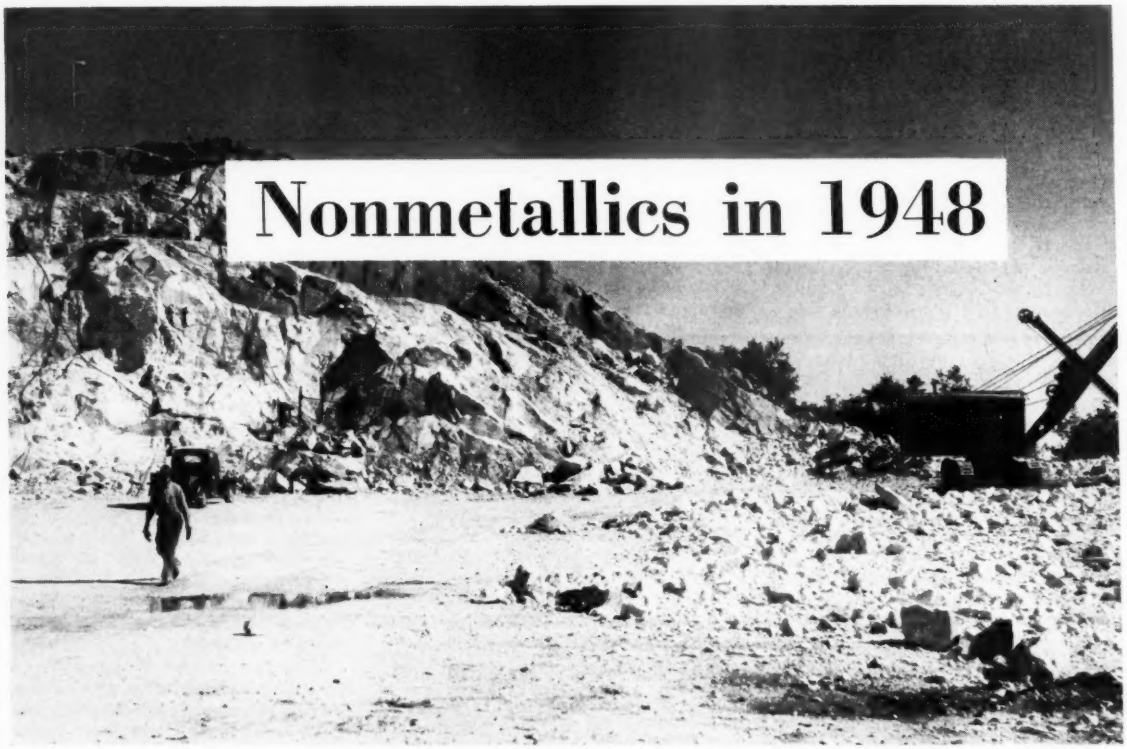
(*Continued from page* 103)

war, are constantly being advocated in Washington. Last year the Republican Congress declined to pass such legislation but this did not end the controversy. Several new blueprints are being prepared. Meanwhile the steel industry has had experience with voluntary controls under governmental auspices as provided in the Taft Voluntary Allocation Program (Public Law 395). This Act expires on February 28, 1949 and a lively debate on this whole subject is anticipated.

Basing Point Decision Disrupts Industry

Another 1948 development which cannot yet be fully evaluated is the Supreme Court decision outlawing multiple basing points. Basing-point selling is, common in marketing important metals. Although conditions are not identical with those in the cement industry, which was the test case, the legality of phantom freight and freight absorption practices in other industries is in doubt. The steel companies immediately abandoned customary procedures "under which all sellers quote identical prices for delivery to the same destination"; apparently the system favored by the Federal Trade Commission, as supported by the Court, is for each producer to fix his own price independently and then to quote the same price fob, his plant, to all consumers wherever they may be. Combined with the substantial increases and readjustments in railroad freight rates which continued into 1948, the long range effect of this system may be a change in the geographic pattern of several mineral-based manufacturing industries. Due to the remarkable growth of population and industry on the Pacific Coast and the development of other new market centers resulting from population shifts, the stage is already set for more decentralization. It does not follow that plants in older manufacturing centers must be abandoned but new plants may have to be built in other localities—preferably closer to raw material supplies or closer to expanding markets, or both. Legislation to clarify the problems created by the Supreme Court decision is currently before Congress.

Nonmetallics in 1948



Nepheline syenite open-cut mine at Lakefield, Ontario

Consumption of Industrial Minerals Continues Upward Trend

By WILLIAM H. WAGGAMAN
Senior Mineral Technologist
Bureau of Mines

IN GENERAL, the demand for industrial minerals during 1948 continued its upward trend, and in many instances the consumption attained all-time peaks. At least nine of the nonmetallics are on the strategic and critical list of minerals and are being stock-piled, but civilian uses rather than possible emergency needs were largely responsible for the increased demand.

Certain nonmetallics serve a variety of purposes, and therefore broad classifications based on specific uses are more or less arbitrary; nevertheless, it is both customary and convenient to group them according to their main or outstanding industrial applications.

Abrasives

The broad term "abrasives" includes a wide variety of minerals ranging from the diamond (hardest and most costly) to silica sand, the cheapest and most plentful, and down to chalk and calcium phosphates, which are so mild that they are employed only for polishing and finishing relatively soft metallic and nonmetallic products.

Industrial Diamonds—

The search for further sources of metallic and nonmetallic minerals to maintain, as far as possible, this Nation's self-sufficiency involves deeper drilling through heavy strata of harder rock. This exploratory work has called for the wider and increasing use of diamond drills. Diamond powders for polishing and cutting wheels also were in great demand, and the supply hardly has been adequate to meet the current needs of industry. Approximately 75 percent of the diamonds sold are used for industrial purposes, and all are imported from Africa and South America. Since diamonds are on the strategic list of minerals, they must also be stockpiled to meet possible emergencies.

At a meeting in New York, September 1948, modified specifications for the grading of diamond powder were proposed and later approved by the Bureau of Standards, the Bureau of Mines, and the producers and consumers of diamond powder. The chief changes were to narrow the size ranges of certain grades.

The working of diamond-bearing alluvials in Venezuela has been stepped up; but the methods employed are crude, and little mechanized equipment is employed. The average size of the diamonds from the Gran Sabana field (eastern Venezuela) is about ¼ carat, although much larger stones have been found.

Corundum—

Natural corundum an abrasive next in hardness (Mohs' scale) to the diamond is also on the strategic list of minerals. Although corundum is widely distributed in nature, there are few if any commercial deposits in this country, and the bulk of the supply normally comes from South Africa. Imports have not been adequate to meet the needs of both industry and the stock-piling program. In 1948 the Bureau of Mines reported on various occurrences of corundum in Georgia, South Carolina, Montana, and Ne-

vada, but none of these deposits appear to offer much industrial promise.

Natural Silicate Abrasives—

Ample supplies of pumice, pumicite, and garnet were available for abrasive purposes. Preliminary figures indicate there was an increase in consumption of all these abrasives in 1948. The better grades of pumice are again being imported, and much of this material was consumed in mechanics' soap and scouring powders, and for polishing purposes, whereas garnets were used for abrasive paper and woodworking. Garnets were mined chiefly in Idaho and New York.

Manufactured Abrasives—

The chief abrasive compounds manufactured in the electric furnace are fused alumina and silicon carbide. Whereas the former has essentially the same chemical composition as corundum, it lacks the sharp, tough cutting edges that make the natural mineral more suitable for snagging wheels, the dressing of metal castings, and the rapid grinding of lenses. For many purposes, however, fused alumina serves quite well, and the indicated consumption amounted to about over 180,000 tons in 1948.

Less than half this quantity of silicon carbide was consumed in 1948, but although the amount of fused alumina used has fallen considerably below the wartime peak, the consumption of silicon carbide has trended upward since 1945.

Demand for Building Materials Booms

There was a heavy demand for almost all types of building materials in 1948. The mounting price of lumber, as well as the fire hazard and cost of maintaining wooden structures, has caused prospective builders to look toward nonmetallic minerals and their products for more durable and, if possible, cheaper structural materials.

Incomplete figures indicate that the output of sand and gravel, crushed and dimension stone, cement, and gypsum all rose above the production levels of 1947.

Pumice, Perlite, and Expanded Clays—

Special interest was evinced in pumice and expanded perlite as lightweight concrete aggregates. Over 20 concerns have installed equipment for expanding perlite and are manufacturing this product on a pilot-plant or commercial scale.

Much attention also was given to the practicability of producing lightweight aggregates from certain shales, clays, slate, and finely divided material discharged into waste ponds in preparing Florida pebble phosphate for the market. By pugging such materials (with or without the addition of a bloating agent) and calcining the extruded or nodulized mixtures at temperatures ranging from 1050 C to 1250 C, strong, lightweight products have been obtained that promise to be useful, particularly in areas where natural rock suitable for concrete aggregates is scarce.

A report on the manufacture of lightweight aggregates from the various raw materials mentioned above will be published by the Bureau of Mines at an early date.

In cooperation with the National Slag Association, the Bureau of Mines has studied the production and utilization of iron blast-furnace slag. A bulletin on this subject has been prepared and should be published in 1949.

Insulating Materials

The general term "insulator" is applied to materials that retard heat losses, prevent leakage of electric currents and the passage of sound waves. Materials suitable for one of these purposes, however, are not necessarily applicable to another use.

Asbestos—

The demand for all types of asbestos was heavy during 1948, and supplies of long-fiber or spinning types of chrysotile were inadequate to meet both industrial and military needs. Such asbestos is on the strategic list of minerals.

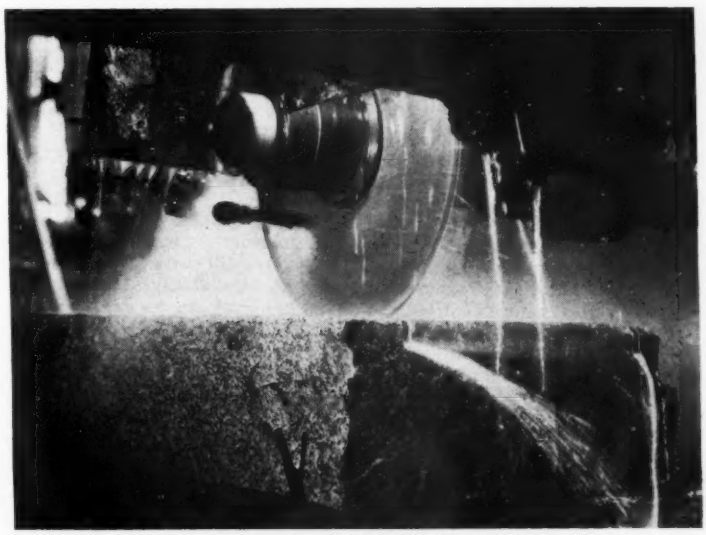
The Canadian mines, the world's chief source of asbestos for brake linings, heat insulation, and shingle stock, were taxed to capacity.

The mines in Vermont were active, but their output could supply only a fraction of this country's needs for asbestos products. The Bureau of Mines reported on the asbestos deposits of Arizona; and although some high-grade material occurs, the deposits are spotty, the available tonnage is limited, and mining costs are excessively high.

Mica—

Supplies of high-grade muscovite and phlogopite mica of strategic grade were adequate to meet the needs of industry and the stock-piling program. Domestic production of such mica has fallen since World War II owing to industry's difficulty in competing with foreign sources of supply. Some price incentive may be necessary to increase the output. The Bureau of Mines issued a report on several deposits of mica in North Carolina in 1948. Investigations on the manufacture of synthetic products analogous to mica are being actively pushed by the Bureau of Mines and certain other research institutions. Encouraging results have been obtained, but there appears to be no immediate prospect that such synthetics will be produced at a sufficiently low cost to compete with the natural product.

The United States continues to lead the world in the production of scrap



Abrasives are essential industrial minerals

mica for roofing and many other purposes. The heavy-building program in 1948 taxed production facilities to the limit. New dry concentrating machines, particularly suited to the separation of mica and vermiculite from associated minerals, have been developed by the Bureau of Mines. The recovery of scrap mica from the pegmatites of South Dakota was also studied with a view to rendering the separation of other minerals from such deposits commercially feasible.

Vermiculite—

Vermiculite, an altered mica, has the unique property of exfoliating or expanding to many times its original volume when heated to 850 C to 1100 C. The expanded product serves as an excellent fireproof insulator for both heat and sound. It is being used also as an ingredient of lightweight concrete and plasters. There was an increasing demand for vermiculite in 1948, as its value for building and insulation purposes became more fully appreciated.

Expanded vermiculite also is being employed by florists in lieu of sand for growing cuttings and seedlings. The potash appears to be available to plants; and, by the addition of other fertilizer ingredients, a balanced ration is furnished.

Mineral Wool—

Mineral wool is one of the most efficient and cheapest heat-insulating products, since the raw materials required for its manufacture are plentiful and widely distributed. The industry continues to grow as the price of all types of fuel advances, making heat conservation an economic necessity to the average householder.

Methods of evaluating materials for mineral-wool production were reported by the Bureau of Mines, and investigations are being continued with a view to the reduction of the proportion of shot, increasing the resiliency of the mineral fibers, and improving the thermal resistance of the product.

Fertilizer Materials

The demand for fertilizer minerals to meet the need for increased crops has grown to phenomenal proportions. Not only did domestic consumption of potash salts, phosphates, and nitrogenous products reach an all-time high in 1948, but heavy exports of such materials to restore depleted and devastated agricultural lands abroad placed an added strain on our mining and manufacturing facilities. There is no indication that the consumption of fertilizer minerals will decrease for several years at least.

Phosphate Rock—

For the sixth consecutive year, the production of phosphate rock showed substantial gains. Roughly, the estimated output was about seven percent over that of 1947, formerly an all-time high.

Florida retained its preeminent position as the greatest single phosphate-producing area in the world, and virtually all operators in that field expanded their production facilities. The Noralyn phosphate mine and recovery plant operated by the International Minerals & Chemical Corp., went into production early in 1948. This is the largest single phosphate mine in the world, with an estimated annual capacity of 1,500,000 tons of rock. An electric furnace plant of the Victor Chemical Works near Tarpon Springs, Fla., also started operations during the year.

The Tennessee mines were also active, although a substantial proportion of the rock mined in that State was smelted in local electric furnaces to produce elemental phosphorus, pure phosphoric acid, and high-grade phosphate salts. The Monsanto Chemical Co. installed its fifth electric furnace in 1948, making this company the largest single producer of elemental phosphorus and phosphoric acid.

The production of western phosphates in 1947 more than doubled that of 1946, and indications are that a further increase in output was attained in 1948. Most of this rock was mined in Idaho and Montana, but Wyoming and Utah supplied appreciable amounts.

Part of the increase in production of western rock is due to purchases by the Government for export to Japan; but farmers in this area have begun to realize that their land must be fertilized to maintain and increase crop production and hence are purchasing larger quantities of superphosphate and concentrated phosphate fertilizers.

The Westvaco Chemical Co. is erecting a phosphorus electric furnace at Pocatello, Idaho. It is understood, however, that the product will be used largely in the manufacture of phosphoric acid and relatively pure phosphate products for the food and chemical industries.

Plants at Permanente, Calif. (near San Francisco) and at Seattle, Wash., are producing phosphatic fertilizer by fusing phosphate rock with magnesium-bearing minerals (olivine). The product is not water-soluble but shows a high availability, as measured by its solubility in neutral ammonium cetrate solution.

No production of phosphate rock was reported from South Carolina, Kentucky, and Arkansas during 1948.

Potash—

Preliminary figures indicate that the production of potash salts in the United States exceeded that of 1947 by approximately seven percent. The 1947 output was previously an all-time high. The natural salt deposits of New Mexico were the chief source of potash, but the brines of Searles Lake, Calif., and the Salduro Marsh, Utah, furnished substantial tonnages. Byproducts of borax and other salts were obtained from these latter sources. A report on the mining methods and practices of the Potash Co. of America, Eddy County, N. M., was published by the Bureau of Mines in 1948.

Minor quantities of potash-bearing materials were obtained from one cement mill and from organic sources. As far as is known, however, no soluble potash was produced in 1948 from alunite and potash-bearing silicates.

Nitrogen Products—

No known natural commercial deposits of nitrates occur in the United States, but the many synthetic ammonia plants erected before and during World War II furnish a large proportion of the nitrogenous products required for military and industrial purposes. Although the output of these plants is supplemented by substantial quantities of ammonium sulfate obtained as a byproduct in coking coal, the demand for nitrogen products is somewhat greater than the domestic supply. Even with the imports of natural sodium nitrate from Chile, the nitrogen situation may be described as "tight."

Metallurgical and Heavy Chemical Minerals

Directly or indirectly, a multitude of industrial minerals are employed in manufacturing metallic products, but fluxing materials, such as limestone and fluorspar, are outstanding examples of nonmetallics essential to the metallurgical industry.

Sodium salts, sulphur, and pyrites, as well as lime, are the main nonmetallics employed in the manufacture of so-called heavy chemicals.

Limestone—

Limestone for metallurgical use occurs in such enormous quantities that it is inconceivable the United States will ever lack an adequate supply. Local shortages, however sometimes involve shipment of this raw material from more distant deposits, thus increasing the cost of smelting operations. The quantity of metallurgical limestone employed bears a more or less constant relation to the iron and steel produced. There was a strong demand for limestone, both for smelting and chemical purposes, during 1948, and the consumption probably surpassed that of the previous year.

Fluorspar—

The consumption of fluorspar in 1947 was approximately 24 percent

above that of 1946, and preliminary figures indicate a further increase in 1948.

Approximately 50 percent of the fluorspar was consumed in metallurgical processes, but large quantities of high grade rock also were employed in the manufacture of hydrofluoric acid. Organic and inorganic compounds of fluorine are playing an increasingly important industrial role, and safer methods of producing and handling this dangerous element have been developed. Substantial tonnages of fluorspar or its derivatives were also used in enamels, glass, and insecticides.

The Bureau of Mines reported on various domestic fluorspar deposits and described methods of concentrating these ores to obtain acid-grade products.

Salt and Soda Products—

The consumption of salt (from all sources) in 1947 reached an all-time peak of 16,138,374 tons, and preliminary figures indicate that the amount consumed in 1948 was fully 100,000 tons higher. Approximately 68 percent of the salt is used in the manufacture of soda ash, chlorine, and other chemical products; 13 percent for table salt, food packing, curing, refrigeration, and livestock feeding, about 3 percent for water treatment, and the balance for miscellaneous purposes.

At least seven companies produced sodium sulphate, carbonate, or both from natural sources such as brines and desiccated lake deposits. Preliminary figures indicate that the output of such salts was approximately 250,000 tons.

The production of borax was also at a high level, and indications are that the tonnage consumed equaled or surpassed that of 1947. The Pacific Coast Borax Co. is the largest manufacturer of borax and boric acid, but several of the companies mentioned above produce substantial tonnages of borax in addition to various other salts.

Sulphur—

The expanding demand for sulphuric acid by the fertilizer, oil, chemical, and metallurgical industries was largely responsible for a further increase in sulphur consumption in 1948 and output reached an all-time high.

Most of the larger producers of sulphuric acid are now burning sulphur instead of pyrites to obtain sulphur dioxide. Not only are such plants more efficient than those using pyrites as a raw material, but elaborate dust-catching and gas-cleansing equipment is unnecessary to obtain pure and highly concentrated acid.

Byproduct sulphur and sulphuric acid were also produced in substantial quantities by the gas plants and smelters, and there are indications that the amount of acid from the latter source may increase as the demand for fertilizer in the Western states continues to expand.

Ceramics and Refractories

With few exceptions, the United States is well provided with the raw materials required for the manufacture of ceramics and refractories. Moreover, the technological advances made during World War II and in the years immediately following have rendered this Nation independent of foreign sources for a number of the ceramic and refractory products formerly imported.

Feldspar—

From the data so far available the output of feldspar in 1948 equalled or surpassed that of 1947, when the sales of ground feldspar reached a record high. The vast bulk of the feldspar was used in the manufacture of glass, pottery, and enamels. Minor quantities, however, were employed directly for abrasive purposes as an ingredient of scouring soaps and in sweeping compounds.

Although feldspar was mined in at least 15 states, North Carolina continued to be the leading producer. Appreciable tonnages of aplite and nepheline syenite (materials somewhat similar to feldspar but having a lower content of silica) were used in the manufacture of glass and ceramic products. The bulk of the former came from Amherst and Nelson Counties, Va., but the latter originated almost entirely from the Blue Mountain deposits, Ontario, Canada.

Clays—

Whereas most of the clay produced is employed in ceramic and refractory products, certain types, such as kaolin, bentonite, and fuller's earth play more important roles in the paper, rubber, oil, and chemical industries.

Improved methods of beneficiating the raw material and better understanding of the blending and processing steps involved in manufacturing finished products have resulted in a wider use of domestic clays and a decrease in imports.

Apparently the output of virtually all types of clay increased in 1948.

Reports on methods of evaluating adsorptive and bleaching clays were issued by the Bureau of Mines during 1948.

Graphite—

Mining of domestic graphite was stepped up somewhat during 1948, and it is estimated that the production exceeded 5000 tons as against less than 4400 tons the previous year.

Appreciable tonnages of manufactured or so-called amorphous graphite were produced for such purposes as lubricants, pencils, paints, etc. This country, however, depends chiefly on foreign sources for its requirements of high grade lump and large flake graphite suitable for the manufacture of crucibles. Such material is on the strategic list of minerals and is imported from Madagascar and Ceylon. Owing to disturbed conditions and lack of modern mining equipment, the output from these islands has been inadequate to meet both industrial and stockpiling needs.

Carbon and graphite linings for

Mining Florida phosphate rock

furnaces and auxiliary equipment wherein high temperatures and corrosive conditions are involved, have proved highly effective and are coming into wider use.

The Tennessee Valley Authority has replaced its ceramic-lined phosphorus combustion chambers with those constructed of water-cooled graphite blocks.

Kyanite—

The production of kyanite for refractory purposes was also accelerated in 1948. Whereas domestic kyanite exhibits an uneven expansion and hence has a greater tendency to chalk when highly heated than Indian kyanite, these defects can be counteracted, in part, by blending it with topaz before making it up into finished refractories.

The shortage of Indian kyanite led to investigations of the suitability of the finer grains of Kenya, East Africa, kyanite that may be more readily obtained. Some change in the specifications for kyanite may be necessary if this latter material is to be employed for stock-piling purposes.

Investigations on the possibility of domestic silimanite for making up high-grade aluminum silicate refractories are being carried out by the Bureau of Mines at its Norris, Tenn., Station.

Miscellaneous Minerals

Barite—

Although barite enters into a wide variety of industrial products, such as pigments, paint extenders, fillers for rubber and paper, and barium chemicals, the bulk of this mineral is consumed as a weighting agent in heavy drilling muds. Increasing exploration for oil has brought about greater demand for barite and domestic production continued at a high level. Preliminary figures indicate that the output equaled or exceeded that of 1947, when an all-time record of 887,304 tons was obtained.

Ore-dressing studies were made by the Bureau of Mines of barite ores from New Mexico, Missouri, and Arkansas, and the mineral successfully separated from other constituents, in some cases with the simultaneous recovery of a valuable by-product.

Lithium Minerals—

Immediately after the war the consumption of lithium minerals showed a sharp drop, but the demand again took an upward turn in 1946. Apart from its value as a powerful reducing agent, lithium in the form of various compounds has a number of important industrial applications.

Lithium stearate added to lubricants increase the efficiency of the latter at subzero temperatures. Small additions of lithium compounds to ground enamel frits lowers the firing temperature, give greater glass and increase corrosion resistance of the final products. Reports on certain spodumene-bearing pegmatites in the Black Hills of North Dakota were published by the Bureau of Mines in 1948. Metallurgical tests showed that a large proportion of the lithium minerals could be separated by flotation in a concentrate containing over four percent LiO_2. Other marketable constituents of this pegmatite were feldspar and mica.

Investigations by the Bureau also showed that 85 percent of the lithia in spodumene can be recovered by sintering this mineral at 1050 C with a mixture of lime and gypsum and leaching the sintered product with water.

Quartz Crystals—

Natural quartz crystals suitable for telephony and radio-frequency control continue to be imported almost entirely from Brazil, although it is reported that the Bell Telephone and the Naval Research Laboratories have produced such crystals successfully by synthetic means.

The general process employed in the manufacture of synthetic quartz is an adaptation of a German technique wherein the crystal is grown from a seed placed in a solution of silica and sodium hydroxide at temperatures of 350 C to 400 C and under pressures of 2000 to 3000 psi (the vapor pressure of the system). The entire process is conducted in a sealed steel container. So far, the crystals grown have not been large, but there appears to be an excellent chance that synthetic crystals of commercial grade can be thus produced.

The fact that smaller oscillator plates are now being employed than was thought practicable in the past has made it possible to utilize more fully the imported crystals of strategic grade.

In 1948 the Bureau of Mines reported on an occurrence of quartz crystals in Lemhi County, Idaho, but the deposit is small and offers little commercial promise.

Aluminum

(*Continued from page* 106)

above those established for primary metal.

Practically all primary metal produced in North America is obtained from bauxite. There were two developments of significance in bauxite during the year. A new deposit was discovered in Clackamas County, Oregon, about 35 miles southeast of Portland. Preliminary studies, however, indicate that this ore will not be suitable for the production of aluminum by present processes, but it may be valuable for other purposes. Plans for large scale mining of bauxite in the Los Islands, West Africa, were announced by Aluminum Limited, Canada. Development of these deposits is expected to produce some 250,000 tons of ore annually, which will be shipped to the company's smelter at Arvida, Quebec, for processing.

Magnesium

DURING 1948 about 17,000,000 lb of primary magnesium plus 8,000,000 of secondary and scrap magnesium were consumed. An estimated 5,000,000 lb of secondary magnesium was used in aluminum production and other non-magnesium industries, bringing total metal consumption of magnesium to about 30,000,000 lb.

Production during the year totaled about 20,000,000 lb. No new production plants were built during the year and no new sources of magnesium were developed. The price remains unchanged at 20½¢ fob producer's plant.

Several new uses for the light metal were developed during the year. Magnesium products found new use in photoengraving and other graphic arts application. Magnesium sheet and extruded forms were successfully utilized in truck body construction.

Following the long use of magnesium for cathodic protection of pipelines, extruded rods were used in 1948 for the similar protection of domestic water heaters. The treatment of gray cast iron with magnesium before pouring, with resulting remarkable increases in strength and ductility of the product, was announced during the year. It is expected that the method will be developed extensively in 1949 as it is of great potential significance in the iron industry.

Shipments of magnesium alloy cast and wrought products increased about 12 percent over 1947 shipments to total 14,000,000 lb. To produce these magnesium alloy products approximately 16,000,000 lb of metal were required, of which about 9,000,000 lb was primary magnesium ingot, leaving an apparent consumption of secondary and scrap of 7,000,000 to 8,000,000 lb.

Taking a five-ton bite of Tennessee phosphate

Potash and Phosphate in '48

Production Increases—New Plants and Processes in Operation

By JAMES A. BARR
Chief Engineer
International Minerals and Chemical Corp.

DOMESTIC PRODUCTION of all grades of potash salts increased by 10 to 15 percent in 1948 over 1947, which approximated 1,050,000 tons K_2O. As in the previous year, 1948 production was practically equivalent to the shipments. There was no stocking at the mines and plant inventories remained at only the nominal levels required by shipping and seasonal consumption. It is possible that 1949 can see another 10 to 15 percent increase in output.

In 1948 the consumer situation improved over 1947 and requirements were more fully satisfied by increased production. The potash industry as a whole observes the principles of voluntary allocation to consumers based on past consumption, with due regard to new consumer capacities. Practically all domestic production is reserved to domestic consumers, since only 2 percent or less was shipped to foreign countries in the Western Hemisphere. Canada is not included in the 2 percent figure. Japan was supplied by U.S. Army purchases mostly from European sources.

Small lots of potash were occasionally offered for import into the United States at higher than domestic prices. It is interesting to note that these price differences are narrowing and may reflect better foreign operations.

There has been a substantial increase in production from French and German mines that might amount to 250,000 tons K_2O. Due to lack of accurate information from back of the "Iron Curtain," the overall estimates are speculative. Exports to the United States held at about the 20,000 ton (K_2O) level. The manpower situation in the western zones is materially improved and there is evidence of some improvement in the Russian zone. Spanish potash production is at a high level and estimated to greatly exceed prewar levels.

ESTIMATED WORLD ANNUAL CAPACITY 1946-47

	Approximate Average Grade Percent Ore K_2O	Tons K_2O
France	18.0	700,000
Germany	13.0	1,800,000
United States	23.0	800,000
U.S.S.R.	15.0	240,000
Spain	20.0	150,000
Poland	....	85,000
Palestine	Brine	65,000

Carlsbad Basin Plants Improve Methods

At Carlsbad, N. M., the United States Potash Co. maintained a consistent improvement program during 1948 which resulted in added production. The 16-mile company railroad between mine and refinery was changed to Diesel haulage with a 70-ton General Electric Cooper-Bessemer locomotive with speeds of 3 to 25 mph on mostly favorable grades, maximum against load 0.5 percent, with train loads of 2200 tons gross, 1500-ton useful load.

The refining process is based on fractional crystallization. Steam is supplied by bleeder-type turbines which generate power with a favorable steam balance. Water requirements for cooling are over 30,000 gpm; obtained as a circulating flow from the Pecos River. A forced draft Marley cooling tower is also used to keep water temperature within required limits, i.e., 5 percent approach to the wet bulb. An automatically controlled Zeolite-type Permutit Co. plant, softens make-up water. Daily dosages of 18 lb of chlorine controls algae and animal growth. Uniform winter and summer refinery conditions are thus obtained.

At the mine site, the tabling plant for production of granular potash was improved by adding a 75-ft thickener for desliming ahead of tabling where sylvite is separated from salt, after reagentizing.

Underground, a new and heavier 18-HR Joy loader was put into operation. The old loaders were the smaller Joy 11-BU.

The use of Millisecond delay, DuPont blasting caps at the face have resulted in much better fragmentation of the ore, facilitating handling and aiding further crushing at the surface plant.

Early in 1948, the Potash Co. of America, Carlsbad, N. M., increased its output by 16 percent. Demand increased so that plant additions are now being made for further substantial increases. This work includes new and parallel facilities starting underground and through the refinery, including a new shaft, a larger hoist at the No. 1 shaft, with added underground equipment such as mine cars and loading machines. The refinery is being enlarged and the flow sheet changed to use a new and revolutionary flotation process, developed by the company staff. The added facilities include new grinding units, flotation machines, filters, dryers, and tailing disposal equipment.

Plant output has been kept at the maximum and will be augmented by the new installation early in 1949 after a brief shut-down for final connections. The company has a small plant at the Carlsbad mine for the production of "technical" or high grade muriate (chloride) of potash. This also is being considerably enlarged.

The International Minerals and Chemical Corp. has followed a consistent program of metallurgical and unit improvement during the year, all of which resulted in greater output. The underground operations are completely mechanized and obtain the high production of 33 to 34 tons per day per man underground.

The mine is laid out on a checker board pattern. The face is drilled by rotary electric drills with Kennametal insert bits; undercut with a modified shortwall machine mounting a 9-ft bar, blasted using "fast delay" caps and loaded by Joy BU-11 machine into shuttle cars for panel haulage to main line haulage by "long-low-wide" steel cars and electric locomotives.

Mine cars are dumped by a rotary dump into a feeder hopper followed by a single roll crusher. The crushed ore is transferred to skips by an automatic measuring pocket. This operation is more or less typical of the "basin" practice.

An evaporation and crystallizing unit, now under construction, is due to go into operation in March. This new unit will produce technical grade muriate of potash.

Modern Mining Methods Utilized

Although fast delay blasting caps have not been in use long enough to publish detailed data, the indications point to saving in drilling, powder, and better fragmentation. The latter is most important as it will permit direct loading on belts to supplement or even supplant locomotive and car haulage underground. The use of smaller diameter powder with "quick delay" shooting is effecting further savings.

Underground belt haulage is getting considerable study at all the mines and one company is making an initial installation which will be watched with interest. Another company is making a study of skip hoisting in vertical shafts, vs., belt conveyor with a 1100-ft lift in a 15-deg slope. The 15-deg slope will permit sinking and mucking out the slope with a Joy 11-BU loader.

Drill jumbos are being installed on a trial basis; also, larger Joy loaders and higher capacity electric shuttle buggies. Studies of Diesel-motor power for shuttle buggies show promise of lower costs in properly ventilated workings.

During 1949, interesting information should be available on improvements in flotation practice and further refinements in crystallization and the base exchange process used in the manufacture of potassium sulphate from langbeinite and sylvinite. Some nominal improvements have been reported at the other two producing companies in California and Utah.

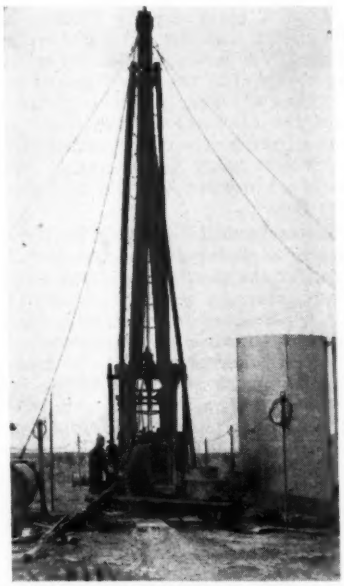
Canadian Potash Field Holds Promise

Recently a visit was made to the newly discovered potash area in Saskatchewan, Canada, near Unity, north of Regina, where the Provincial Government kindly provided a plane and a most competent "Bush" pilot so that the area was comfortably visited. The main discovery is in a drilled well at about 3600 ft depth where a good commercial thickness of sylvinite was

Loading docks of Potash Company of America, Carlsbad, N. M.

cored. Shaft sinking would be expensive, as most of the shaft would be in shales with some water and traces of gas and oil.

There is a gas field a few miles away from this potash discovery where the gas is obtained to supply the town of Unity. Considerable surplus is available, some of which will be used in a nearby salt refinery where brine is obtained from drilled wells. The possible potash areas are vast and only a relatively few drill



The International Minerals and Chemical Corp. drills for potash in the Carlsbad, N. M., area

holes widely spaced are as yet available for information. The potash beds rise gently to the north and should approach the surface within 200 miles. A drilling program contemplated by the Government for this winter should provide valuable information on the shallower deposits. This great northern area has scarcely been touched and there are many other interesting possibilties beside potash.

PHOSPHATE

Domestic phosphate production in 1948 is estimated to range between 9,500,000 to 9,700,000 tons as compared with an approximate 1947 tonnage of 9,121,000 tons. The influencing factors were the starting of a new Florida operation, lesser low grade production in Florida, and a sharp drop during the last half of the year of Army shipments of Western phosphate to Japan. There was little change in production in Tennessee.

Production costs increased due to higher rates for labor, oil, fuel, power, and some supplies. The producers absorbed a major part of the increase as prices only rose four to six percent.

An anticipated sharp increase in shipments during the latter part of 1948 did not materialize partly due to the above factors and partly due to a severe nitrogen shortage which limited demands for fertilizer consumption. Exports, at a higher level during the first of the year, were held back during the last of the year by exchange difficulties.

In the foreign picture, the Tunisian and Algerian mines produced approximately 2,500,000 tons in 1947 and 1948 but did not reach prewar levels. These are low grade producers. Attempts to beneficiate the ores and thus widen the market were not successful. Morocco mines are high grade producers and increased their output by about 400,000 tons. Egyptian mines, still dislocated by the war, were estimated to have produced about 400,000 tons. Russian domestic shipments are guessed at 1,500,000 tons in 1947 with exports only at 350,000 tons. Ocean Island and Naru production is approaching normal, and is expected to reach 1,000,000 tons in 1950.

Mining Practices Better Efficiency

Surface Mining—In Florida it is usual to strip the 15 to 20 ft of sand-clay overburden with 15- to 20-cu yd draglines and to mine the underlying phosphate "matrix" of about the same depth with the same machines; those purchased in the last few years are of the walking type.

The matrix is piled on the surface and washed by a "gun" (hydraulic monitor) into the suction pit of a 14-in., 600-hp centrifugal mine pump and pumped through 16-in. pipe lines to a washer. When distance requires, extra pumps are put in line. Automatic and remote controls are used for the "in-line" pumps.

In Tennessee smaller draglines are used to strip and mine, dumping the phosphate "muck" into trucks. Mining conditions are difficult due to deposits of "brown phosphates" often occurring in "cutters" or solution channels in the bed rock limestone.

At Sage, Wyo., and Hall, Mont., stripping follows much the same pattern. Bulldozers are used to strip hillsides for short hauls; the electric, caterpillar-mounted shovels load the overburden, which is mostly shale, for transport to the dumps, in trucks. Mining of the phosphate follows the same pattern. The phosphate is usually crushed before shipment.

Underground Mining—At Conda, Idaho, the Anaconda Copper Co. uses top slicing because of soft hanging conditions on a steeply pitching bed. The ore is milled down raises to a haulage level for transport to the crushing and drying plant before shipping to Anaconda.

It has been reported that a lower grade phosphatic shale in the hanging wall will be mined along with the regular vein to simplify mining methods. The ore is to be beneficiated before use in the wet method phosphoric acid plant.

In the Garrison, Mont., field the beds are mined underground mostly using slushing to mill down raises. The pitch isn't enough for shrinkage stoping in most cases. There is one mine at Douglass Mountain, south of Drummond, Mont., which uses shrinkage stoping. It is shut down at present.

Plants Expand to Raise Output

In 1948 a major addition was made to mine and plant capacities for the production of Florida phosphate. There were also substantial additions in electric furnace capacity for the production of elemental phosphorous. Work is well underway to add even more electric furnace capacity and build wet process plants for the production of phosphoric acid and subsequent products.

No new plants, mines, or substantial capacity increases were completed in Tennessee and the west. One replacement plant is in the preliminary construction stage in Tennessee.

Swift and Co. completed an extensive program of new plant construction and improvement during the year near Bartow, Fla. First completed was the new Varn mine and flotation plant, following well-established lines. The plant is now operating efficiently.

One of the most noteworthy projects was the completion of a completely mechanized wet storage bin 1100 ft long, and 90 ft high, with a reclamation tunnel underneath; all served by a system of belt conveyors in and out of the storage to a new drying plant with one 8 by 80 ft direct, oil-fired, rotary dryer with numerous auxiliaries, including a high efficiency dust collecting system.

In the same location, the company built a contact sulphuric acid, a wet

process phosphoric acid, and triple superphosphate plant, thus forming a completely integrated system from mine to finished product.

The Virginia Carolina Chemical Corp. continued their improvement program at the Homeland Mine and flotation plant which was completed in 1946 and expanded 50 percent in 1947.

Treatment Methods Improve

Other improvements in the Florida phosphate field include a high efficiency dust collector system installed at the calcining kiln plant, and larger slime ponds now under construction to guard against stream pollution.

The central drying plant for the Florida operation will be completely modernized wtih a belt conveyor type wet storage trestle and tunnel followed by the most modern drying and grinding facilities.

The Davison Chemical Corp. constructed a flotation plant in Polk County, Fla., with an annual capacity of 125,000 to 150,000 tons of high grade phosphate. This newest addition will employ the latest developments and scientific controls, using a double, anionic and cationic, flotation process, the latter being a silica float for final cleaning.

The Tennessee "brown" phosphate operations were expanded and a modernization program initiated.

International Minerals and Chemical Corp. completed an extensive program of construction and modernization. The electric-trolley locomotive system of yard switching was replaced by Diesel-electric locomotives, along with a complete revamping of the primary and secondary electric-distributor system. The Noralyn program was completed and is in operation. A new mine was opened and equipped with a walking-type dragline along with a rebuilt older machine.

Early in 1948 the Noralyn washing and flotation plant was completed. This plant with an annual capacity of 1,500,000 tons of high grade phosphate per year has been described in numerous publications. The novel features included two thickeners 385 ft in diameter, the world's largest; a screen-type sizing section, and stage flotation. The plant is operated by a system of automatic controls from a control center.

Following the float plant is a belt conveyor, trestle type wet storage, reclamation drying and shipping plant to make a completely integrated unit from mine to railroad car. The dryer is 8 by 80 ft.

A notable increase in electric furnace capacity was added in 1948 because of a large unsatisfied demand for elemental phosphorous by the chemical trade.

The Victor Chemical Works enlarged their electric furnace capacity at Mt. Pleasant, Tenn., over 25 percent. This involved changes in electrical equipment, storage and handling facilities for phosphate rock, also an additional nodulizing kiln together with enlargement and changes in general facilities.

Monsanto Chemical Co. has an integrated electric furnace operation near Columbia, Tenn., where ore is mined, treated, and finished elemental phosphorous is produced. No extensive changes were made in the mining and washing system except to increase wash water to approximately 7000 gpm for higher recoveries. A new 20,000 kw electric furnace was put into operation. The size is noteworthy as the increase has been progressive over the years. Formerly a 5000 kw unit was tops. About 15 percent of the furnace feed is Florida phosphate used for economic and other reasons which change from time to time. Most of the elemental phosphorous produced is shipped to the Trenton, Mich. plant for conversion to phosphoric acid and the manufacture of sodium phosphates. The increase in sodium phosphate production goes chiefly into detergents. Many other phosphorous chemicals are produced but the company reports no appreciable change in calcium, ammonium, or organic phosphates during the year.

Comprehensive Research Marks Year

In washing brown Tennessee phosphates, higher recoveries were effected by use of a Bird continuous centrifuge to recover phosphate particles as fine as ten microns, increasing P_2O_5 recoveries from 45 to 50 percent to more than 60 percent; this was further increased to 75 to 80 percent by adding NaOH as a dispersant. The problem of settling tailing water to prevent stream contamination was solved by adding calcium sulphate, a byproduct from a nearby, wet-process phosphoric acid plant.

Pilot plant work on briquetting Tennessee brown phosphate sands and matrix was completed and is being translated into a commercial unit to provide feed for the TVA fused tri-calcium phosphate furnaces near Columbia, Tenn.

Another agglomerating method developed, involves pelletizing a plasticised phosphate sand-matrix, in a rotating cylinder followed by calcining in a gas-fired shaft kiln. This method uses much less fuel than a rotary kiln of like capacity and operates at considerably lower cost than a sintering or nodulizing plant.

Results from several years' operation of two oil-fired, fused tri-calcium phosphate furnaces indicate that many problems have been solved and improvements made, such as, improved burner ports and a cooling system which have resulted in better operation. Some shell corrosion problems still remain for further research. The furnace product, a fused tri-calcium phosphate containing about 27 percent P_2O_5, has favorable fertilizer characteristics. The estimated costs make this sytem attractive for numerous locations. Results have indicated that natural gas is a suitable fuel and that Florida phosphate is suitable for fusion and defluorination.

A pilot plant electric furnace of new design was successfully operated by the TVA at Wilson Dam on smelting phosphate. The new furnace not only has a higher thermal efficiency than the conventional furnaces, but uses a charge of smaller particle size, which eliminates agglomeration necessary at present for standard furnace feed.

Successful tests were run on Idaho phosphate shales, in an electric furnace, for the production of elemental phosphorous. A private company is now constructing a commercial unit in Idaho following the above research. It is the policy of the TVA to make their findings available to private industry.

Considerable progress was made during the year in the production of calcium meta-phosphate (plus 60 percent P_2O_5) following ten years of experimentation at Wilson Dam. This fertilizer is made by burning phosphorous and reacting the hot P_2O_5 with lump phosphate in a shaft. Molten meta-phosphate is tapped and cooled as a glossy solid and ground before use. Many troubles were encountered in process control and from refractory failures.

An improved method was developed in which pulverized phosphate was blown into the combustion chamber where most of the reaction took place and could be closely controlled. Unreacted phosphate containing agglomerated phosphate is recovered in the shaft column. The grate supporting the agglomerate phosphate, which gave so much trouble, was replaced by a water-cooled ell connecting the combustion chamber with the shaft. A new demonstration unit is under construction at Wilson Dam.

Other studies are under way involving treatment of phosphate rock with nitric acid and ammonia following some European practices. This research aims at providing industry with the technology of a new variation in this phase of fertilizer manufacture. The Bureau of Mines continued its investigation on beneficiation of Western phosphates and the feasibility of recovering vanadium from Western phosphate shales.

Scrap Metals

Ferrous Scrap Consumption Reaches Record High—Nonferrous Recovery Falls

By CHARLES WHITE MERRILL
NORWOOD B. MELCHER
and
A. J. McDERMID

Respectively, Chief and Mineral Economists
Metal Economics Branch
U. S. Bureau of Mines

THE GROWING importance of scrap in supplying United States industry with metal was illustrated in 1948 when for the third successive year more secondary than primary lead was produced and when approximately one-half of the aluminum supply was reclaimed material. Scrap dealers, smelters, and ingot makers, however, found their raw material supplies below those for 1947. In contrast to the supply situation in the nonferrous secondary metals, the consumption of iron and steel scrap established a new record in 1948, surpassing the former peak reached in 1947. The decline in supplies of nonferrous scrap, which was most pronounced in aluminum, is explained in part by progressive exhaustion of obsolete war equipment, that has been moving to market since 1945.

Larger supplies of iron and steel scrap, and the accumulation of stocks after midyear, indicated that the iron and steel industry was adjusting itself to high level production and was making progress toward a return to the prewar ratio of scrap to pig iron in the steel furnace charge. Since the beginning of the war in Europe, as a result of the rapid expansion in steelmaking and the tremendous losses of material at sea and on battlefields, (which under conditions of peace would have flowed back to the furnaces as scrap), the industry has been forced to use a metallic charge disproportionately high in pig.

Of general interest have been several narrowings of the differentials percentagewise between the prices of primary metals and those paid for scrap. The continued short supply of both primary and secondary metal made it seem likely that the differentials would continue narrowed until the large producers of primary metal are able to fill all orders without delay.

Published by permission of the Director, Bureau of Mines, United States Department of the Interior.

Iron and Steel Scrap

Early in 1948 there was some apprehension as to the adequacy of iron and steel scrap for meeting requirements for producing an estimated 88,500,000 net tons of steel during the year and at the same time providing a small tonnage for export. However, in spite of an all-time record consumption in 1948, the availability of scrap increased throughout the year. At the end of the year stocks had increased to 4,000,000 tons. This tonnage is equivalent to only a 50-day supply based on an average daily melt of 80,760 gross tons and 2,463,000 tons per month, achieved in 1948, whereas the prewar figure of 3,293,000 tons on December 31, 1942, represented a 69-day supply.

Stocks of iron and steel scrap dealers and automobile wreckers fluctuated from a low of 156,873 gross tons at the end of February to a high of 275,755 tons at the end of May. The most current figure available for these stocks was at the end of September (177,611 tons).

Consumption of purchased iron and steel scrap during 1948 averaged 2,463,000 gross tons per month, a total of 29,558,000 tons for the year, an all-time record.

Of this total the steel-making furnaces consumed 20,771,000 tons or 70 percent, with open-hearth furnaces alone using 57 percent of the total purchased scrap. The total charge in all furnaces for the year was comprised of 26 percent purchased scrap, 26 percent home scrap, and 48 percent pig iron.

The continued increase in the output of iron and steel in 1948 resulted in a five percent increase in the use of ferrous materials; the quantity used totaled 112,180,000 gross tons, which exceeded the previous record year of 1944 by 3,341,000 tons. Of this total 89,034,000 tons were consumed in steelmaking furnaces, an increase of 4,246,000 tons or five percent over 1947. The balance of the total charge was consumed in ironmaking furnaces, principally the cupola. The consumption in these furnaces totaled 23,146,000 tons, an increase of 1,546,000 tons or seven percent over 1947. Cupola furnaces used 19 percent of the total purchased scrap consumed as compared with 17 percent in 1947.

No. 1 cast scrap at Chicago was selling at $63.50 per gross ton during the first week in January 1948, an increase of $21 per ton over January 1947. A peak price of $74 per ton was reached during April; cast scrap at Pittsburgh reached a high of $70 per ton during November; heavy melting steel at Pittsburgh and Chicago was quoted at $42.75 and $41.75, respectively. During the early months of the year efforts to curb the upward movement of the scrap metal market were indicated by a strong buyers' resistance to scrap prices; however, steel production continued at a rate of more than 7,000,000 tons per month throughout the year, with the exception of February and April. At the end of the year the market appeared stronger than it had for some months, shipments were moving in large tonnages and mills were buying all the scrap they could get at the current higher price levels.

Pig Iron Price Rose

No. 2 Valley pig iron was quoted at $39.50 per gross ton during January 1948, an increase of $9 per ton over the corresponding month of 1947 and by the end of the year had advanced to $46.50. Basic pig iron, Valley followed the same pattern, showing an increase of $7.50 per ton during the year, advancing from $38.50 during the first week of January to $46 at the end of the year.

Large German Scrap Stocks

An Industry-Government Scrap Mission to Germany headed by John L. Haynes, Department of Commerce, made an on-the-scene study of scrap potentialities in Germany from December 30, 1947, to February 26, 1948, and recommended that "the collection, processing, and export of this material should be pursued under military government directives which accord such a program." This mission found that by far the largest scrap supply in Germany and the most difficult to assess in quantitative terms, is rubble scrap. Estimates, not made by this mission but included in its report, place rubble scrap at from 3,000,000 to 10,000,000 tons, of which

the most readily accessible portion is railway, bridge, and industrial type. The gathering of rubble scrap, however, was considered extremely difficult because of the problems involved in identifying or locating the proper owner and then inducing him to part with the material, due to the fact that the reichsmarks he would receive can purchase little.

The mission also reported that dealers' yards were bulging with unprepared scrap, but they were unable to prepare and ship more than 50,000 to 70,000 tons per month, because of the currency and price problems, and dealers' equipment being inadequate or in bad state of repair.

Robert W. Wolcott, president, Lukens Steel Co., at the request of Secretary of Commerce Charles Sawyer, made a study of the German scrap market from June 29, 1948, to July 29, 1948, and upon his return said "there was enough scrap in Germany to support an extensive export program as well as to supply the needs of the German steel industry." He further stated that "a lack of understanding between the American and British Military Governors on several important points is one retardant to the immediate exportation of scrap from Germany." These points were the question of the proper percentages of scrap which should go to the United States, consideration of future allocations, the definition of booty scrap, and the proper prices for scrap export sales. Upon settlement of these points there should be a substantial flow of scrap from Germany to the United States.

Plans made to establish a private corporation under government sponsorship to serve as a single buying agency for German scrap were abandoned in November due to uncertainties, including the price-fixing ban contained in Public Law 395.

Imports of iron and steel scrap data received by the Bureau of Mines from the Bureau of the Census, as of September totaled 199,018 tons, of which 73,035 tons were imported from Germany.

Secondary Nonferrous Metals

Recovery of the important nonferrous metals from scrap in 1948 was somewhat lower than in 1947, owing largely to a growing scarcity of scrap metal. Compared with 1947 on a percentage basis, the recovery of secondary aluminum, lead, copper, and zinc declined 10, 5, 3, and 1 percent, respectively.

Demand for nonferrous scrap materials was generally steady throughout the year. Most scrap items were in tight supply during 1948 although there were indications toward the end of the year of growing abundance in certain items, such as lead battery plates.

Nonferrous scrap metal statistics recognizes three classes: home scrap, new scrap, and old scrap. Home scrap is reused in the plant where generated; statistics on its volume are not generally recorded. New scrap differs from home scrap only in that it is sold for treatment elsewhere. Old scrap is derived from worn-out, damaged, or obsolete metal articles or equipment. Data in this article do not include home scrap. New scrap, which is included, is a measure of industrial activity. Old scrap also included reflects past activity and the current demand for metal.

ESTIMATED CONSUMPTION OF IRON AND STEEL SCRAP AND PIG IRON JANUARY THROUGH DECEMBER 1948, IN GROSS TONS

Month	Purchased	Home scrap	Total	Pig iron
January	2,237,000	2,490,000	4,727,000	4,613,000
February	2,180,000	2,357,000	4,537,000	4,252,000
March	2,665,000	2,580,000	5,245,000	4,508,000
April	2,475,000	2,183,000	4,658,000	3,534,000
May	2,565,000	2,424,000	4,989,000	4,471,000
June	2,455,000	2,367,000	4,822,000	4,440,000
July	2,261,000	2,248,000	4,509,000	4,322,000
August	2,416,000	2,324,000	4,740,000	4,657,000
September	2,404,000	2,427,000	4,831,000	4,625,000
October *	2,700,000	2,600,000	5,300,000	4,800,000
November *	2,600,000	2,500,000	5,100,000	4,700,000
December *	2,600,000	2,500,000	5,100,000	4,700,000
Total *	29,558,000	29,000,000	58,558,000	53,622,000

* Estimated.

Copper and Brass. The total quantity of secondary copper recovered from scrap in 1948 is estimated at 935,000 short tons, a decrease of about three percent from the 961,741 tons reclaimed in 1947. Of the total, 500,000 tons were recovered from old scrap, compared with 503,376 tons in 1947; thus almost all the decline involved new scrap. Continued shipments of brass battlefield scrap to this country from the United Kingdom for conversion to refined copper prevented a more severe decline.

Total recovery of unalloyed copper produced at primary and secondary plants from scrap, including refined copper, castings, copper powder, copper sheet, rod, and tubing, declined ten percent in 1948 to 273,000 tons. Of this figure, primary smelters and refineries are expected to produce about 230,000 of refined copper from secondary material. This output represents a 15 percent drop from the 269,085 tons produced in 1947.

The output of brass and bronze ingot totaled approximately 310,000 tons in 1948, compared with 284,868 tons in 1947. In addition to brass ingot consumed, foundries and miscellaneous manufacturers recovered an estimated 110,000 tons of copper from scrap, virtually equal to the 1947 recovery.

Despite curtailed operation late in 1948 at several brass mills, owing partly to a shortage of refined copper, the output of brass mill products is expected to remain at about the same level as in 1947, when production totaled 404,350 tons. It is anticipated that recovery of secondary copper in brass mill products will continue at approximately the 1947 level (289,754 tons).

A recent development in the use of brass scrap is the separation of this material into copper and zinc by a distillation process at one of the large chemical plants. The slab zinc produced is of commercial grade and the copper is sufficiently pure to be used in making copper sulfate. At present only yellow brass scrap, containing chiefly copper and zinc, is being used, but if the process can be developed to treat economically alloys containing copper, lead, tin, and zinc, refiners' sources of raw materials will be vastly increased.

Lead. The recovery of secondary lead from scrap declined moderately in 1948. Preliminary figures indicate a total of approximately 485,000 tons reclaimed, compared with 511,970 tons in 1947. Nevertheless secondary recovery exceeded domestic mine production of lead for the third successive year and smelter production from domestic ores and base bullion for the fourth year in succession.

The continued high level of lead-base scrap conversion is attributable to the record price of pig lead, which rose from 15¢ per pound, New York, to 21.50¢ in three advances during the year.

Under the influence of high prices, consumers' stocks of lead-base scrap declined from 101,277 tons at the end of February 1947 to 51,976 tons at the end of January 1948. Inventories continued to decline during the first half of 1948 but not so precipitously, the low point being reached at the middle of the year, when inventories totaled 49,721 tons.

During the first seven months of 1948 scrap consumption and receipts trended downward, thus indicating a general scarcity of scrap, due partly to reluctance on the part of dealers to move scrap in anticipation of fur-

ther price advances. Lead smelters in their efforts to obtain raw material sharply reduced the treatment charge for battery lead plates, which had been up to $30 or more in the early part of 1947. In some instances the charge was waived entirely. During the latter half of 1948, receipts, consumption, and stocks of lead scrap rose steadily with stocks at the end of the year reaching an estimated 60,000 tons. The smelting charge for battery lead plates was reported increased in the New York area $30 to $40 near the end of December, indicating a more plentiful supply of this material. Consumption of battery lead plates is expected to total 366,000 tons in 1948, compared with 411,088 tons in 1947, and use of all lead-base scrap will probably reach 640,000 tons, which is 31,272 tons less than the total for 1947.

Aluminum. The recovery of secondary aluminum from scrap in 1948 is estimated at 300,000 tons, or ten percent less than the 331,946 tons reclaimed in 1947. The progressive exhaustion of aircraft scrap is reflecting itself in a decline of 128,000 tons in 1948, compared with 150,956 tons in 1947. Consumption of aircraft scrap by secondary smelters, primary producers, rolling mills and naval air stations was about 36,000 tons, compared with 54,292 tons in 1947. Private contractors who had purchased aircraft scrap and produced remelt ingot at army airfields began to run short of the material in 1948 and are estimated to have used only 66,000 tons. Total aluminum scrap consumption will probably be 50,000 tons less than in 1947, when 411,000 tons were treated.

Production of aluminum alloy ingot from scrap by secondary smelters, exclusive of remelt ingot made by the airfield contractors, was approximately 178,000 tons in 1948, compared with 193,942 tons in 1947. From preliminary estimates the primary producers and rolling mills are expected to recover 74,000 tons of secondary aluminum.

Although aluminum casting alloys are generally of different composition than wrought alloys, either type of scrap can be melted with primary ingot to make alloys for both foundries and rolling mills. The secondary smelters producing alloy ingot for castings must therefore compete with primary producers for scrap purchases — a situation different from that prevailing in the secondary copper and brass industry.

Zinc. Total recovery of secondary zinc in 1948 will be approximately 308,000 tons, compared with 310,793 tons in 1947. Zinc production from zinc-base scrap will be about the same in 1948 as in 1947, when 163,354 tons were reclaimed. Zinc salvaged from other than zinc-base scrap will total 145,000 tons in 1948.

Output of redistilled slab zinc rose from 55,879 tons in 1947 to about 61,000 tons in 1948 and production of zinc dust also increased. The recovery of secondary zinc in chemicals, however, dropped from the 1947 level. Reclaimed zinc in lead-free zinc oxide decreased to about 13,000 tons in 1948.

About 80 percent of all the zinc scrap used is by-product residue scrap consisting of dross and skimmings from galvanizing operations, chemical residues resulting from the manufacture of sodium hydrosulfite, and flue dust from brass ingot makers. As in previous years, most of the metallic zinc scrap was supplied to consumers by dealers, and the greater part of the drosses and residues moved directly from industrial sources to the consumers without entering dealer channels.

Scenes like this will become memories as the trend to increase mechanization progresses

As Viewed by A. W. DICKINSON of the American Mining Congress

IMMEDIATELY following Inauguration Week, with officials and constituents from the home States departed from Washington, the committees of Congress settled down to the long grind entailed in the consideration of the thousands of bills introduced and the conduct of hearings on measures to which preferred attention has been accorded.

Senate and House Foreign Relations Committees have before them a proposed 15-month extension of the Marshall Plan, in which the President has called for $5.5 billion in further appropriations. Having concluded its immediate work on extension of the Foreign Trade Agreements Authority, the House Committee on Ways and Means will now go into a time-consuming consideration of the Social Security system and the multitude of proposals which have been made for extending its coverage and increasing benefits of various types.

Taxation

The House has passed and the Senate is expected to quickly approve a resolution extending from February 15 until May 1 the time within which Congress may set the Government spending ceiling. Meanwhile, Senator Byrd (Dem., Va.) has predicted that there will be determined resistance to the proposed $4 billion increase in taxes and to the Administration's $41.9 billion budget request. Senator Taft (Rep., Ohio) and Senator Bridges (Rep., N. H.) are calling for cuts in expenditures rather than increases in taxes.

The National Minerals Advisory Council of the Department of Interior has recommended a tax policy including: (1) an exemption from income tax for a minimum period of three years (as in Canada), and preferably five years, on all production income commencing when a new mining venture starts commercial production; (2) a substantial increase in present percentage depletion allowances; (3) adoption of a liberal attitude on depreciation by the Internal Revenue Bureau; (4) the portion of dividends of mining companies arising from a reserve based upon the depletion allowance for income tax purposes to be tax free to the receivers (as was the case prior to 1932); and (5) liberalization of present tax laws and present Treasury regulations concerning the method of handling exploration and development expenses.

The Council under the Chairmanship of Dr. Donald H. McLaughlin declared: "Only preliminary exploration expense directly applicable to the discovery of a new commercial deposit should be required to be capitalized and then only when the profitable operation of the deposit is assured. Further development expenditures after discovery should all be considered as direct operating expenses currently deductible or deferred over resulting production because such expenditures are really part of the productive costs of operation."

Trade Agreements

By a vote of 319 to 69 the House passed a bill extending the Reciprocal Trade Agreements authority to June 12, 1951. The measure not only restores all of the authority of the original Act, under which the President may cut import duties by as much as 50 percent below the rates in effect on January 1, 1945, but drops the authority of the U. S. Tariff Commission to establish "peril points" on commodities subject to negotiation.

Representatives of the mining industry gave testimony before the Committee on Ways and Means asking in the interest of the national defense that strategic and critical minerals be excluded from the further operation of the Act. This precaution had previously been urged by the American Mining Congress before the Senate Finance Committee in 1945 and will be urged again in the course of the Senate hearings on the House-passed bill.

Stockpiling

The 1950 budget for the stockpile program calls for new obligational authority of $525,000,000 as well as supplemental authorizations of $310,000,000 for the current fiscal year. In the past three years $800,000,000 in obligational authority has been granted by Congress and by the end of fiscal year 1950 materials valued at $700,000,000 will have been transferred to the stockpile from war surplus inventories and from ECA operations. Of the total stockpile objective of $3.7 billion, materials and authorizations amounting to $2.3 billion will have been provided by the end of fiscal 1950, and it is estimated that by that time materials valued at $1.6 billion will be in the stockpile.

Munitions Board Chairman Carpenter reported on February 3 that by December 31, 1948 all funds authorized by Congress for stockpile pur-

★ ★ ★ ★ ★ ★ ★ Washington Highlights

CONGRESS: Committees speeding hearings.

TAX: No bill before May or June.

TRADE AGREEMENTS: Administration bill passes House.

STOCKPILING: Purchases of $835,000,000 this year.

TAFT-HARTLEY ACT: Rocky road for Administration bill.

WAGE-HOUR: 75c minimum indicated.

STEEL ALLOCATIONS: Authority extended.

FREIGHT RATES: ICC schedules regional hearings.

BASING POINT: Redrafting Johnson bill.

★ ★ ★ ★ ★ ★ ★

chases had been either obligated or earmarked. He indicated that the impact of the Board's buying on the civilian economy will be mild, stating: "Although it is no longer considered practical to purchase only materials found to be in excess of current industrial requirements, purchases in direct competition with industrial consumers are avoided where possible."

Taft-Hartley Act

Senate Labor Committee hearings on the Administration's labor bill opened January 31 on a schedule which called for their closing February 10. The measure would repeal the Taft-Hartley Act and reenact most of the old Wagner Act. By February 9 minority committee members Taft (Ohio), Aiken (Vt.), Smith (N. J.), Morse (Oreg.) and Donnell (Mo.) had drawn such damaging statements concerning the bill from Government witnesses that the full Committee voted to extend the schedule of the hearing through February 23. This will permit a goodly number of valuable witnesses to present the experiences and viewpoint of management. The position of the mining industry will be presented to the Committee by President Howard I. Young of the American Mining Congress.

Senator Taft and other minority committee members through close questioning of Government witnesses have secured admissions in the record as to the beneficial effect of a number of provisions of the Taft-Hartley Act, including: (1) the requirement that labor unions file financial reports with union members and the Secretary of Labor; (2) elimination of Communists' activity in labor union management; (3) a no-strike ban on Government employes; (4) authority for employers to petition for an election; (5) requirement that unions bargain in good faith; (6) right of employers to freedom of speech; (7) separate representation for professional workers; (8) statute of limitations covering unfair labor practices; and (9) allowing employes to vote in a decertification election to unseat a union as their bargaining agency.

Senator Taft has introduced 16 amendments to the Administration bill which would, in a substantial measure, restore the Taft-Hartley Act. The issues are being battled every step of the way in the committee and will undoubtedly be carried on to the Senate floor.

Minimum Wage

The House Committee on Education and Labor is now drafting a bill to amend the Wage-Hour Act, following two weeks of hearings on a measure which would extend the Act's coverage to include practically all activities "affecting commerce." The measure would raise the minimum wage from 40c to 75c an hour and up to $1 an hour under "wage orders" recommended by industry committees; would authorize downward adjustment of such orders in event of a general business recession, but not below the 75c statutory minimum; would define "regular rate of pay" so as to exclude premium pay for overtime hours, Saturdays, Sundays, holidays, etc., and permit crediting of such premium pay against statutory overtime; would limit present retail and service exemptions to employers having not more than four sales or service establishments and a total business volume of not over $500,000 annually; would authorize the Secretary of Labor to sue for unpaid minimum wages or unpaid overtime compensation; and would change the statute of limitations under the Portal-to-Portal Act from two to four years and place responsibility for administering the Act under the Secretary of Labor.

In the meantime the Committee may report a bill to meet the overtime-on-overtime problem by permitting unions and employers to set overtime rates for week-end, holiday, and night shift hours outside the normal work period, provided they maintain at least a time and one-half premium. Need for such a measure was caused by the U. S. Supreme Court decision in the New York Longshoremen's case last June.

Steel Allocations

Congress has extended until September 30, 1949 the authority to negotiate voluntary industry agreements to allocate scarce commodities. It is under such authority that the Office of Industry Cooperation, Department of Commerce, is allocating steel to the mining machinery manufacturing industry and to the mines in the anthracite region of Pennsylvania.

It has been stated that the seven-month extension was enacted pending consideration of a broader stabilization program which the White House will submit to Congress.

Freight Rates

January 11 was the effective date for the interim freight rate increase granted by the Interstate Commerce Commission on December 30 and discussed in the January JOURNAL. Hearings are to be held on the railroads' request for a permanent 13 percent increase in Washington, March 1; Chicago, March 14; Montgomery, Ala., March 21; Salt Lake City, March 21; Oklahoma City, Okla., March 28, and San Francisco, March 28.

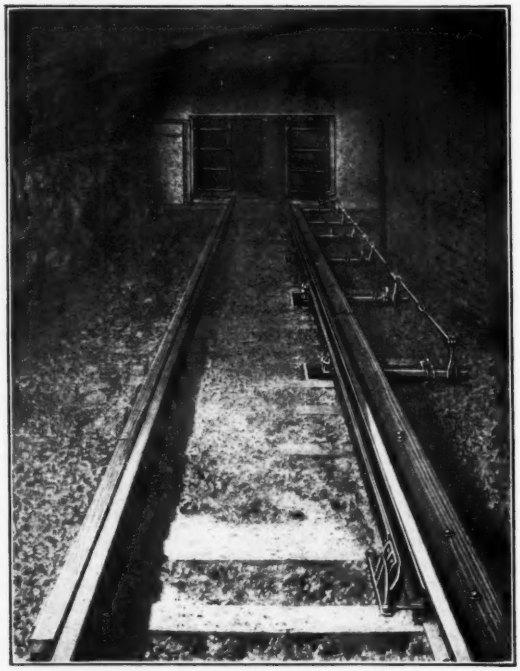
The Mining Association of Montana has urged its State Board of Railroad Commissioners to defer any freight rate increase on interstate traffic until after the scheduled ICC hearings are completed. It was pointed out that rates on ores and concentrates had always been unduly high and have already increased greatly over wartime levels as a result of higher metal prices.

Basing Point

Three days of hearings have been held on a bill by Chairman Ed Johnson (Dem., Colo.) of the Senate Committee on Interstate and Foreign Commerce to legalize freight absorption in the absence of conspiracy. The hearings are now in recess while further efforts are made to redraft the measure in line with suggestions in the course of the testimony.

In the House, Representative Francis Walter (Dem., Pa.) has introduced a bill which would provide a two-year moratorium on anti-trust law prosecutions against "individual, good faith, delivered price systems, and freight absorption practices." Walter's measure would not apply to cases pending in U. S. Courts on February 1, 1949, and would not allow new cases to be brought on charges of freight absorption (in the absence of conspiracy) for two years from the date the bill becomes law. His purpose is to give Congress time to observe effects of Supreme Court's basing point rulings and Federal Trade Commission policies.

Canton Devices Pay Your Dividends



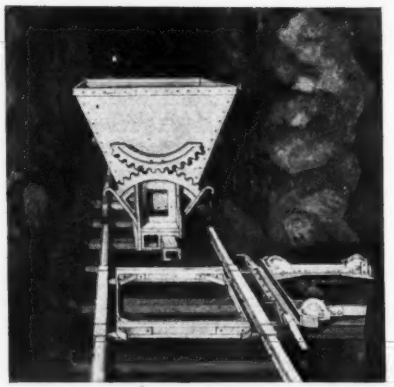
The American Mine Door Company specializes in mine items that pay for themselves through economy and increased efficiency. Less labor—increased coal output are the reasons.

Automatic Door

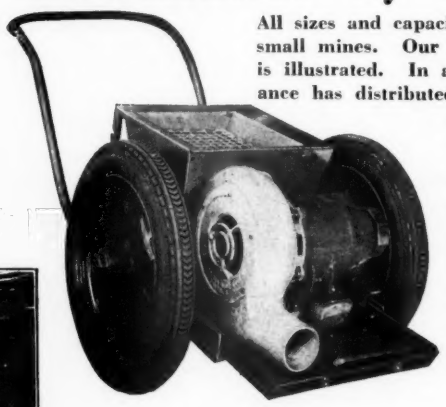
There is no slow-down or hesitation, there is nothing protruding from the wall. Cars never touch the door as they are flipped open by the mechanical mechanism attached to track. The doors click shut after passing of the trip. No trapper boy to get hurt.

"Canton" Car Transfers

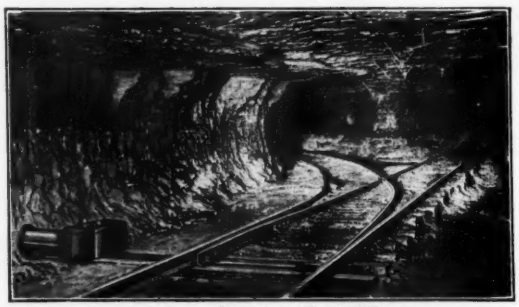
Load a whole train of empties on a single track with one "Canton" Car Transfer. Built for all sizes of rails now in use. 20 seconds' time for a car change, 2 minutes to remove car transfer from track, 2 minutes to install on track.



"Dustributors" by Canton



All sizes and capacities, large and small mines. Our Mighty Midget is illustrated. In actual performance has distributed more than a ton of dust per hour during an entire shift including transporting and filling time. Easily transported by any conveyance. Write for complete catalogs.

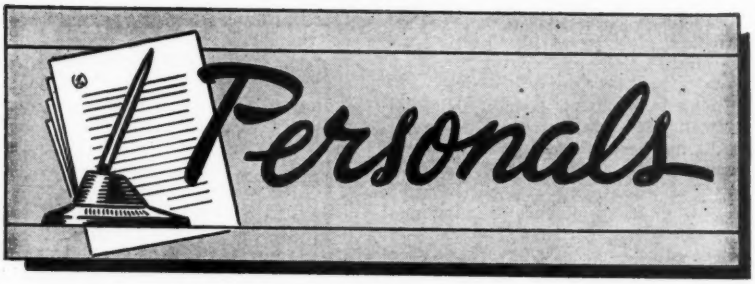


Automatic Switch Throw

The Canton Switch Thrower is a fast, dependable solenoidal mechanism automatically throwing switch points ahead or behind the trip running at full speed. It is operated: (1) by the motorman; (2) by remote control; (3) by hand, and is adapted for use as an automatic de-railer.

Write for complete catalogs.
Please use street and zone numbers.

AMERICAN MINE DOOR COMPANY
2063 Dueber Ave.
CANTON 6, OHIO



Harrison M. Lavender of Douglas, Ariz., has been named to the board of directors of Phelps Dodge Corp. Lavender is vice-president and general manager of Phelps Dodge in charge of all western operations of the corporation. Also named to the board of directors were **Jared Ingersoll** of Philadelphia and **Kenneth Isaacs** of Boston.

Louis Ware, president, International Minerals & Chemical Corp., was elected a director of the Illinois Central Railroad Co. on November 30.

Richard W. Storey, Consolidation Coal Co. (Ky.), has been promoted from engineer to assistant chief engineer under **R. J. Howard**, chief engineer. **Marshall E. Prunty** has been transferred from the post of superintendent of Mine 204 to safety director of all operations of the Company. **William Stapleton** has been appointed superintendent of Mine 204 in addition to Mine 207. The mines were recently interconnected.

Guy Riddell, former mining advisor to the Military Government and National Economic Board in Korea, and consultant on mining matters in Jajan and the Philippines, has returned to his New York headquarters at 32 West 40th Street, New York.

Fred C. Babcock has been elected to succeed his father, the late E. V. Babcock, as president of the Babcock Coal & Coke Co. **John K. Saxman, Jr.**, is vice-president and treasurer, and **Robert P. Babcock** is secretary. The company coal mines and coke ovens are located in the New River district of southern West Virginia.

After more than 50 years of continuous service, **C. H. Benedict**, chief metallurgist and chemist, Calumet and Hecla Consolidated Copper Co., Mich., retired at the end of 1948. Mr. Benedict was first employed in 1898 at an assay office operating in conjunction with stamp mills. He was closely responsible, during his many years of service, for many important developments in the chemical and metallurgical field. The Lake Linden reclamation project and the many refinements and perfections that have been installed since the original inception of the idea, were largely Mr. Benedict.

George Trevorrow, formerly of Duquesne Light Co., is now general superintendent of coal mines for Consumers Mining Co., Harmarville, Pa. He is succeeded at Duquesne Light Co. by **James C. Elkins** in the post of general superintendent of coal mines.

D. D. Moffat, vice-president of Kennecott Copper Corp. and general manager of the Utah Division, and **J. D. Shilling**, assistant general manager, retired from their positions on the first of the year. **J. C. Kinnear**, vice-president in charge of the southwestern division will also assume general supervision of the Utah Division. **Louis Buchman**, succeeds **Mr. Moffat** as general manager. **E. W. Engelmann** was made assistant general manager.

AT THE Annual Business Meeting of the American Mining Congress, in Washington, D. C., January 26, 1949, new members were elected to the Board of Directors as follows: J. C. Kinnear, vice-president in charge of western operations, Kennecott Copper Corp.; Harry M. Moses, president, H. C. Frick Coke Co.; and M. L. McCormack, manager, rock drill department, Ingersoll-Rand Co.

Retiring members of the Board of Directors are Ralph E. Jamison, president, Jamison Coal & Coke Co.; Thomas McNally, president, McNally-Pittsburg Mfg. Corp.; and D. D. Moffat, vice-president, Kennecott Copper Corp.

Carl W. Myers, Denver, Colo., has been reelected president of the Colorado Fuel & Iron Corp.

Lemuel B. Hunter has been appointed to the position of manager of the raw materials department of Inland Steel Co. **Carl B. Jacobs** has been named to succeed Mr. Hunter as fleet manager of the company.

Wesley P. Goss has been elected to the vice-presidency of Magma Copper Co. and of San Manuel Copper Corp. Goss has been general manager of Magma for several years and has directed the exploration program at the San Manuel property, a Magma subsidiary. His new title for both organizations will be vice-president and general manager.

Roy G. Stott, U. S. Bureau of Mines mining engineer with the Duluth district offices, has been transferred to the district offices at Wilkes-Barre, Pa.

Gyle B. Pyles has been appointed assistant project engineer for the Oliver Iron Mining Co., in the Hibbing-Chisholm district. **C. R. Burton** succeeds him as superintendent of maintenance. **J. R. Shoenig** comes forward as assistant superintendent of maintenance. In Oliver's mining engineers department, **James R. Steel** has been appointed field supervisor of exploration.

After 36 years' service with The Virginian Railway, **E. D. Hanes**, retired as coal traffic manager. Appointment of **Norman F. Cuthrell** as general coal freight agent in charge of solicitation of coal traffic was announced.

R. J. Bonnemort, formerly chief engineer of the Balatoc Mining Co., Baguio, P. I., is now in charge of the mine of the Consolidated Eureka Mining Co., at Eureka, Nev.

A. W. Hawley, formerly secretary of the Preston County Coke Co., Cascade, W. Va., has been elected president of the company. He succeeds H. C. Greer, deceased.

E. F. Goodner has been named executive vice-president of American Gilsonite Co. to succeed **C. F. Hansen.** Prior to coming to Salt Lake City Mr. Goodner was located in Portland as general manager of California Asphalt Co.

Andrew J. Gaber has been named research engineer for the Nelson L. Davis Co., Chicago. Mr. Gaber was formerly manager of the Terre Haute office, Commercial Testing and Engineering Co., and had been plant control chemist at Champion No. 1 coal preparation plant, Pittsburgh Coal Co.

Robert E. Sorenson has been appointed chief engineer of the Hecla Mining Co., Wallace, Idaho. He succeeds Charles H. Foreman who has retired after 40 years of service.

Paul A. May has been appointed controller of **Mine Safety Appliances Co.**, Pittsburgh, Pa.

J. D. Gillenwater has been made superintendent of the Bailey Construction Corp.'s coal stripping operations in Thomas, Logan County, W. Va.

Sam H. Morris of Globe, Ariz., has been renamed chairman of the Arizona Copper Tariff Board, following his repointment by Governor Dan E. Garvey, Other members named to the board, for a two-year period, are: **C. R. Kuzell** of Douglas, **Mark Gemmil** of Prescott, **Richard D. Searles** of Phoenix, and **Wesley P. Goss** of Superior.

John D. Sullivan, assistant director, Battelle Memorial Institute, Columbus, Ohio, has been named chairman of the new division of the AIME known as the Extractive Metallurgical Division. **H. M. Shepard,** general manager of the American Smelting and Refining Co., Baltimore, Md., will be secretary of the division. The division was founded on the nucleus of the AIME committees on the reduction and refining of aluminum and magnesium, copper, lead and zinc.

Paul D. Merica, vice-president of the International Nickel Co. of Canada, Ltd., succeeds **Robert C. Stanley** as director of American Metal Co.

— *Obituaries* —

James Stuart Douglas, 80, founder of the town of Douglas, Ariz., and guiding genius of the old United Verde Extension Mining Co. at Jerome, Ariz., died at his home in Montreal, Canada, January 2, 1949.

"Rawhide Jimmy" Douglas was born June 19, 1868, at Harvey Hill Mine, Megantic Township, Quebec, Canada, a son of Dr. James and Naomi Douglas. His father, a distinguished mining engineer, was prominently identified with early copper mining developments in Arizona, founding the Copper Queen Consolidated Mining Co., the predecessor of the present Phelps Dodge Corp.

James S. Douglas came to Arizona in 1890 and for a brief period served as assayer for the Copper Queen Consolidated at Bisbee. Later he served as assayer and superintendent for the Commercial Mining Co. in Yavapai County, Ariz. From 1900 to 1909 he was superintendent of the Picacho mine, a Phelps Dodge subsidiary in Sonora, Mexico, and superintendent of the Moctezuma Copper Co. at Nacozari, Sonora. During the Carranza revolution in Mexico he was manager of the Cananea Consolidated Copper Co. at Cananea, Sonora.

Douglas attained his greatest success in the Verde mining district of Arizona, where he directed the exploration and development of claims which later became the property of the United Verde Extension Mining Co. When that corporation was formed in 1912, he was named its first president and continued to hold the office during the entire life of the mining company.

He is survived by two sons, Lewis W. Douglas, U. S. Ambassador to England, and James Douglas of New York, secretary of the Phelps Dodge Corp.

Al Trestrail, a pioneer and crusader in mining safety work, died at his home in Gaastra, Mich. on November 13. He had served as district safety supervisor for Pickands Mather and Co. on the Menominee Range from 1918 until his retirement on September 1, 1948. Mr. Trestrial included in his efforts in safety, welfare, and social activities, participation in the work of the American Red Cross, the YMCA, the Masons, the Boy Scouts, National Safety Council, and the Lake Superior Mines Safety Council. He directed a safety program that won five Sentinels of Safety Trophies and many honorable mention awards in the national competition among underground metal mines.

Cassius I. Cook, general manager of the Consolidated Coppermines at Kimberly, Nev., died December 22.

Mr. Cook was born near Portland, Oreg., June 18, 1886. He received his early education in Boise, Idaho and graduated from the University of Idaho in 1911. He became superintendent of the Silver City Mining and Milling Co. at Silver City, Idaho, following his graduation. He went to Alaska in 1915 and later to British Columbia, where he was employed by the Granby Consolidated Mining, Smelting and Power Co., as assistant mine superintendent. In 1927 Mr. Cook accepted a position as mine superintendent of Consolidated Coppermines and from 1932-1935 when Coppermines was closed down, he operated a small gold property in Grass Valley, Calif. He went to Silverton, Colo., in 1935 as general superintendent of the Shenandoah-Dives Mining Co. He returned to Kimberly, Nev., as general manager of the Consolidated Coppermines in 1940 and held that position until the time of his death.

Mr. Cook was an active member of the American Mining Congress, the AIME, Colorado Mining Association, and a director of the Nevada Mine Operators Association.

Jack R. Wietzel, 56, master mechanic for the Magma Copper Co. for 32 years, died unexpectedly at the Magma Hospital in Superior, Ariz., on December 22. He had undergone an operation for appendicitis a short time previously and was preparing to leave the hospital when stricken.

William L. Stancliffe, 65, former vice-president in charge of sales of the American Car and Foundry Co. in New York City, died suddenly January 16. He had been connected with the company for nearly 23 years.

William H. Barrett, vice-president of the Holmes-Darst Coal Corp., died in Cincinnati, Ohio, on December 19. Mr. Barrett had been associated with the coal industry in Cincinnati for more than 30 years.

Bryan W. Whitfield, Sr., Harlan, Ky., a pioneer in opening the Harlan Field, died January 4 at the age of 86. Mr. Whitfield developed the Clover Fork Coal Mine, the Harlan Collieries Co., the Bell Coal Co., and the Kentucky Jellico Coal Co. He was influential in organizing the Harlan County Coal Operators Association and served as its vice-president for a number of years. Considered one of the more progressive coal operators, he worked diligently in the establishment of Appalachian Coals, Inc.

George M. Colvocoresses, 69, consulting mining engineer of Phoenix, Ariz., died unexpectedly at his home December 14. Born in South Orange, N. J., Colvocoresses was a veteran of the Spanish-American War and a graduate of Yale University.

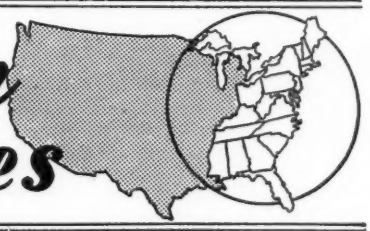
In 1913, Colvocoresses became associated with the Consolidated Arizona Copper Co. as general manager. In 1927 he opened his offices as consulting engineer in Phoenix. He represented Meteor Crater Exploration Co. when that organization undertook an extensive drilling program to discover the buried meteor believed to have caused meteor crater.

Daniel C. McNaughton, 65, of Silverton, Colo., a state mine inspector for the Colorado Bureau of Mines recently died after a long illness.

Robert McAllister, 72, widely-known Colorado coal mining official died recently in Pueblo, Colo. He was with the Colorado Fuel and Iron Co. for more than 50 years and established an outstanding record as a coal mine inspector.

NEWS and VIEWS

Eastern States



Full Crew Safety-Trained

The Clover Splint Mine of Consolidation Coal Co., Closplint, Ky., is the first mine in Harlan County to be presented with a 100 percent First-Aid Training Certificate by the U. S. Bureau of Mines. The 445 employes of the mine successfully completed a 15-hour course of first-aid training program sponsored by the Safety Department, U. S. Bureau of Mines, Norton, Va. Day and night classes were conducted over a 40-mile area for the convenience of the shifts and for those living out of town. The training program was accomplished through the cooperation of Local Union No. 6331, UMW, and mine management.

Mercury Unit Power Plant

The first postwar mercury unit power plant equipment has been placed in operation in the South Meadow Station of the Hartford Electric Light Co., Hartford, Conn. The system combines the mercury vapor cycle and a steam cycle into a system for producing power from fuel with greater thermal economy than is possible with the steam cycle alone. The new unit generates 15,000 kw and supplies about 200,000 lb of steam per hour to drive existing steam turbines.

The mercury-steam cycle consists of a mercury boiler, in which liquid mercury is vaporized at a comparatively low pressure; a mercury turbine, powered by the vaporized mercury; a generator, driven by the mercury turbine; a mercury - condenser; boiler, where the heat given up by the condensing mercury is used to convert water into steam which is used to drive the steam turbines.

It is expected that more mercury unit power plants will be installed in the future as the mercury cycle offers a simple and profitable means for producing power and is adaptable to a wide range of applications.

Pittsburgh Consolidation Buys Land

Pittsburgh Consolidation Coal Co. has acquired 10,500 acres of coal land containing reserves estimated at about 75,000,000 tons from the Mellon Educational and Charitable Fund. The properties, which were purchased for about $500,0000, are located mostly in Greene County, Pa.

Kentucky Mining Institute Meets

C. B. Burchfield, Black Star Coal Corp., Alva, Ky., was elected president of the Kentucky Mining Institute at the annual meeting held in Lexington, Ky., recently. Other officers are: Bradley Sparks, Luzerne-Graham Mining Co., Greenville, Ky., first vice-president; J. B. Marcum, Blue Bird Mining Co., Hazard, Ky., second vice-

Dumping 70-ton coal cars at rate of one per minute

president; F. P. Kerr, Eastern Coal Corp., Stone, Ky., third vice-president; and A. D. Sisk, Kentucky Department of Mines and Minerals, secretary-treasurer. The program at the annual meeting centered around various problems of mining, safety, and vocational and educational activities.

Benson Mines Operates Pilot Plant

Experiments are now being conducted at a new pilot plant of the Jones & Laughlin Steel Corp. with the aim of doubling production of iron ore at its Benson mines operation. The increase in output will be brought about through the use of nonmagnetic ore. Results of the experiments at the pilot plant, near Star Lake, N. Y., will determine the final design of a large-scale operation involving the use of nonmagnetic ores.

Heavy Scrap Needed

The U.S. Department of Commerce and other Federal agencies are cooperating with industry to sponsor a heavy scrap drive with the object of providing additional tonnages essential to steel production. In 1948, 88,500,000 tons of steel ingot were produced and an estimated 92,000,000 net tons can be produced in 1949 if sufficient quantities of heavy scrap are made available.

The current drive for heavy scrap is directed primarily to industries which have large amounts of obsolete machinery, parts, and equipment; farms with obsolete machinery; and auto-wrecking yards.

It is hoped that increased quantities of scrap can be made available by investigating heavy scrap possibilities in mines and industrial plants and directing such scrap into normal trade channels from whence it will flow to steel mills and foundries.

Personal Appeal for Safety

A unique and positive approach to mine safety is being conducted by the National Coal Association, Washington, D. C., through the use of colorful inserts attached to the pay envelopes of the miners. The inserts, bearing the question "Are you going to be on the payroll next week?" are designed to increase the interest of miners in safety as a personal project. At least 100,000 miners are reached regularly through this point-of-pay medium.

Burned Pyrite Enriches Oxide Concentrate

The Spaulding iron concentrating plant of the Republic Steel Corp., located in Alabama, is enriching their red ore table concentrate with burned pyrite shipped from the Tennessee Copper Co.

One of the cement plants in the Birmingham area is using some of the Spaulding mill tailings in making cement.

Mining Association Formed

G. A. Ellis, president of the Vermont Copper Co. was elected president of the newly formed Northeast Mining Association at a meeting in Boston, Mass., January 14. The Association was formed to promote the best interests of mineral producers in the New England states. E. W. Magnus, Eastern Talc & Magnesia Corp., was elected vice-president and Allen Hearst, Bristol, Conn, secretary-treasurer The Association's executive committee includes the officers and W. C. Cramer, Hartford, Conn.; W. F. Brady, Joy Mfg. Co., Boston, Mass., and J. R. Meyer, New Hampshire state geologist.

Retirement Plan Adopted

Adoption of a retirement plan for the supervisory, technical, and clerical employes of the Johnstown Coal and Coke Co., Johnstown, Pa., has been announced by Andrew B. Crichton, president of the company. Benefits from the plan, retroactive to January 1, 1948, will be based on earnings and years of service, with only one year of service with the company required for eligibility. Approximately 225 employes of the company are not covered by the UMW welfare and retirement fund and are eligible to participate in the new program.

Increased Output Planned by P & R

An investment in excess of $2,000,000 is being poured into a program to expand the output of domestic sizes of hard coal by the Philadelphia & Reading Coal & Iron Co. Two new developments at the company's properties near Pottsville, Pa., will be completed in about a year. One of the developments near Tower City at the western end of the company's holdings in the southern anthracite field is estimated to hold virgin reserves above water of around 10,000,000 tons.

New Facilities for Youngstown Mines' Plants

New washing facilities to improve coking coal and increase output of blast furnaces and steel plants are planned for the new coal preparation plant at Youngstown Mines Corp.'s Dehue, W. Va., coal mines. In 1948 Youngstown Mines installed picking tables as the first phase of the coal preparation plant. The washer is expected to be finished by summer. The entire project will cost an estimated $1,000,000.

Strike-Closed Plant to Reopen

Operations are expected to resume soon at the American Zinc Oxide Co.'s plant at Columbus, Ohio, which has been closed by a strike since August 13. The company's smelters at Hillsboro and Fairmont City, Ill., have also been idle because of the strike.

Handling Zinc Concentrates

The New Jersey Zinc Co. has recently installed filtering and drying equipment to handle zinc concentrates at its Austinville, Va., mine. When this new equipment is placed in operation the mill will be enabled to pipe wet zinc concentrates to a modern filter and drier and then to storage bins where a conveyor will transport the concentrates to freight cars for shipment to the company's smelter at Palmerton, Pa.

It is expected that freezing of the concentrates while enroute to the smelter in cold weather will be eliminated, as the new system will produce dried concentrates containing less than 3 percent moisture.

Titanium from New Sources Likely

Frank R. Milliken and Dr. Roy Dahlstron, National Lead Co., speaking before the New York section of the AIME, indicated that with titanium the ninth most abundant element, it is possible that titanium minerals may be economically produced from the residues of other large-scale treatment plants. Residues from phosphate washers and alumina plants have already been considered and are still being investigated. Extensive field exploration is being conducted by major consumers of ilmenite.

The principal use of titanium compounds is in pigments where its whiteness, chemical stability, low density, and high index of refraction make it particularly suitable. Titanium oxides are also used as dielectrics, glasses, semi-conductors, photo conductors, and for welding rod coatings.

Pure ductile titanium metal can now be produced and it remains for industry to bring about production on a tonnage scale in order to utilize the special properties of the metal that has a corrosion resistance equal to that of stainless steels and possesses the strength to weight ratio greater than any other metal.

Mining Education

In a recent survey conducted by Dean Edward Steidle of the Pennsylvania State School of Mineral Industries, it is pointed out that of the 9619 mineral industries students in all colleges of the United States, only 18 percent are engaged in studying mining. Petroleum students lead, representing 34.5 percent of all mineral industries students, and metallurgy ranks second with 28 percent.

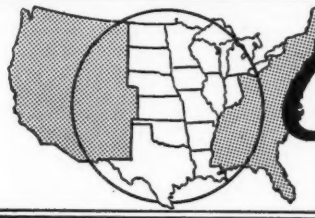
Wilwyn Begins Modernization

In a recent anouncement, William J. Curry, Jr., president, Wilwyn Co., has announced the beginning of a $50,000 modernization program for the company's mine in Cambria County, Pa. The program is designed to step up production from 100 tons a day to 200 tons per day.

Conveyor Standards Now Available

For the first time nationally acceptable safety provisions for the construction and operation of mechanical conveyors and conveying equipment are now available from the American Standards Association, New York, N. Y.

Safety provisions for all types of conveyors are included in the new standard with special provisions for the safe operation of each type. This new standard is unusually pertinent when one considers that in 1946, with the use of mechanical conveying equipment, coal was mined at the rate of slightly more than six tons per man day as compared with two and one-half tons per longer day in 1890 when all coal was hand-mined.



Central States

Briquetting Coal Dust for Smokeless Fuel

Successful briquetting of Illinois coal dust into highly satisfactory smokeless fuel is outlined by Dr. R. J. Piersol of the State Geological Survey at Urbana, Ill., in his new book, "Briquetting Illinois Coals Without a Binder." Dr. Piersol observed through tests that briquets made from Illinois coals without a binder tend to burn in a manner similar to anthracite coal. Burning from the outside inwardly, the outer surface of a briquet becomes incandescent, thereby liberating its heat of combustion principally in the form of radiant heat.

Lake Coal Movement Near Record

In 1948 bituminous coal movement on the Great Lakes totaled 54,693,321 tons as compared to the all-time peak of 55,491,459 tons in 1944. Movement off docks to retailers' industrial outlets has been satisfactory and the opening of the lake season will find most docks clear of coal. A sample survey conducted by Appalachian Coals, Inc., indicates that there is likely to be no falling off in demand in 1949.

Lake Linden Plant Treats Slime

With the exhaustion of coarse sand, the Lake Linden reclamation plant of the Calumet & Hecla Consolidated Copper Co. closed the shore plant and the regrinding plant, which for over 30 years have been responsible for a large percentage of the company's production. This tailings retreatment plant, the world's largest, has completed all but the finishing touches on the job for which it was erected.

Since exhaustion of the conglomerate sands, the dredge has been employed on recovering slime which has sloughed off from the shore plant pool during the cleanup operation. These are being pumped directly to the leaching plant classification system at the rate of 30,000 to 40,000 tons per month. This is about one-third of the average output of the entire plant when it was treating rough sand.

Estimates of the quantity of slime available range from a four- to six-month supply. Slimes are also being used as a source of material for experimental work on abrasives.

For the time being, pending developments on the abrasive plant, the shore plant and conveyor will be held intact. Except for a few items, including one or more 40-ft thickeners which will be used at the zinc property at Shullsburg, Wis., the flotation plant will also be held intact.

Ore Shipments Set Record

A record-breaking shipping season was rung up as the last iron ore carriers headed down Lake Superior on December 30. The last shipload will bring the tonnage carried in the 1948 season to approximately 82,935,000 gross tons, the largest peacetime ore movement in history. It is noteworthy that fewer ships were in the shipping trade this season to move a greater amount of ore than the 82,696,656 tons average moved during war years.

Missouri Mill Increases Capacity

According to reports, Park City Consolidated Mines Co. at Fredericktown, Mo., has reserves of more than 500,000 tons of ore averaging more than 3 percent lead. Milling operations are being expanded up to 500 tons daily, and prospecting and drilling work is continuing in additional areas.

Glidden Operations Cut By Stockpiling

Operations of the metals refining plant at Hammond, Ind., of the Glidden Co., of Cleveland, Ohio, were adversely affected by the Government's stockpiling program, according to executives of the company. The company reported a profit of $5.04 a share as against a net of $7.57 a share for the preceding fiscal year. Government stockpiling of essential metals helped to shorten the supply and raise prices, said Dwight P. Joyce, president, in the company's annual report.

Mather Mine Has Record Output

The new Mather mine of the Cleveland-Cliffs Iron Co. is in the front rank on the Marquette Range after its production last year of 990,757 tons. The capacity of the Mather has not been reached in the property now being worked, as equipment is designed for about 1,750,000 tons annually. The new Mather "B" shaft at Negaunee, Mich., will double the tonnage of the two Mathers when it is opened at its scheduled goal of 3100 ft.

Coal Terminal Construction

One of the largest coal terminals on the upper Mississippi river has been started at North Buena Vista, Iowa. It will be operated by the Mikota Coal Co., Guttenberg, Iowa. The new installation will include a 600-ft long and 70-ft wide landing for coal barges plus five or six acres of land which will be utilized for storage. Current planning outlines completion of the project to permit coal unloading operations during the 1949 shipping season. A large coal processing plant is planned for construction in 1950.

Coal for the terminal will be shipped by rail from Kentucky and West Virginia mines to the Ohio river where it will be loaded on barges for transshipment to North Buena Vista. The new facility will supply industries and retailers as far west as Omaha, Nebr. and north to Minona, Minn.

Surge pile at Oliver Iron Mining Co.'s Mt. Iron, Minn., washing plant. The surge pile is capable of holding 10,000 tons of crude ore which can be withdrawn from the bottom of the pile to the washing plant by means of a pan feeder and underground conveyor system.

Winter Stripping Operations

A new 10-yd dragline is being employed on the winter stripping program at the Perry mine, Nashwauk, Minn., named after Perry G. Harrison of the M. A. Hanna Co. Stripping operations are also being conducted on the Cuyuna range of the Portsmouth mine and also at the Mangan-Stai and the Mangan-Joan properties of the Hanna Co.

In Michigan, dewatering of the Bengal mine at Stambaugh on the Menominee range has been completed and the sixth level of the mine is being opened up. Stockpiling of iron ore is under way at the Hiawatha, Homer, and the Wauseca mines.

Fuel Engineering Conference

On March 9, the 27th Fuel Engineering Conference will be held at the Rackham Educational Memorial Building, Detroit, Mich. This year's meeting will be co-sponsored by the Detroit Section of the American Society of Mechanical Engineers and Appalachian Coals, Inc. One of the outstanding speakers who will address the conference is James D. Francis, president, Island Creek Coal Co. Mr. Francis will discuss "Today's Coal in Tomorrow's Economy," in presenting a comprehensive review of the economics of mining and preparing coal.

Gogebic Range Mine to Go Deeper

Pickands Mather & Co., operators of the Sunday Lake iron mine, Wakefield, Mich., are making preparations to deepen the mine shaft to the 29th level. The company operates five iron ore producers on the Gogebic iron range.

New Stripping Operation

Morgan Mines, Inc., has announced the opening of its newest and most modern strip mine in Williamson County, Ill., south of Herrin in the heart of the Southern Illinois coal field. The new plant will have a daily capacity of about 2500 tons of washed coal.

According to Harrison Eiteljorg, president, Morgan Mines, Inc., the new washing plant tipple has accented neatness, compactness, and efficiency. One man at the control panel controls the entire operation of the washing plant. A single man in the control tower handles the cars and loading booms.

The stripping operations are handled by an electric dragline which has been in operation for several months. The new unit is of the walking type and is equipped with a 12-yd bucket and a 175-ft boom.

Minnesota Plant Produces High Tonnage

Nearly 3,000,000 tons of iron ore were produced by Butler Brothers during 1948. The new stripping plant in South Agnew has proved eminently successful in moving 3,546,914 cu yd of material between June 1 and December 1, 1948.

Martin Iron Mine Leased

The Snyder Mining Co., operators of three iron mines on the Mesabi iron range, has leased the Martin mine on the Cuyuna iron range and contemplates beginning operations in the near future. Two diamond drills that have been in use at the Martin mine will remain on the drilling program.

Illinois Mill Under Construction

Near Galena, Ill., the Eagle-Picher Mining & Smelting Co. is constructing a 1200-tons mill which will handle ore from the recently discovered Graham-Snyder ore body. Two shafts are being completed to tap the ore body. Ore produced from them as well as some custom ores will be handled at the new mill.

C & H Shaft Nears Completion

Shaft sinking near Shullsburg, Wis., by the Calumet Corp., subsidiary of the Calumet & Hecla Consolidated Copper Co., is nearing its objective of 350 ft depth. At this depth it will be the deepest shaft in the southwestern Wisconsin zinc mining district. At present the shaft is making water at the rate of 1000 gpm. The work of mill erection is proceeding concurrently with shaft sinking.

Coal-to-Oil Plant Costs

At the coal-to-oil demonstration plant at Louisiana, Mo., U. S. Bureau of Mines engineers estimated that economies could be effected by the use of improved pressure gasification processes, fully automatic control, cheaper high-pressure vessels, and more efficient use of heats of reaction.

For a hydrogenation plant yielding 30,000 bbl of gasoline and liquefied petroleum gas daily, construction costs were estimated at $244,000,000 with newly-tested innovations and about 25 percent higher without such improvements. In a plant of this size, gasoline manufacturing costs were estimated at 14.3¢ per gallon. This figure does not include revenue from by-products and does not take into consideration return on investment, sales expenses, and other expenses incident to the disposal of the synthetic products.

Utah Iron Ore Reserves

According to a survey report made by the U. S. Bureau of Mines, estimated potential reserves of 500,000,000 long tons of iron ore, including substantial tonnages of good-quality ore suitable for western steel production, are available in Iron County, Utah. About 100,000,000 long tons can be conservatively classified as measured and indicated reserves with a grade of 45 to 50 percent iron and an additional 250,000,000 tons can be inferred from geological and geophysical evidence supported by limited drilling. Inasmuch as the areas remaining to be explored are greater than those already investigated, it is probable, the report points out, that at least 150,000,000 long tons more can be expected eventually. Mining on these large reserves can be conducted economically to depth of 3000 ft.

Between 1923 and 1946 the district has produced 10,139,500 tons. In general, the ore of the contact veins is predominantly magnetite, hard, rich in iron and low in impurities making a valuable open-hearth ore.

Uranium Prospecting

Discovery of radioactive ores in the White Signal Mining District, Grant County, N. M., has resulted in extensive prospecting for uranium. Groups of claims located 70-80 years ago are being explored and new shafts put down.

Horn Silver Plans

Increased exploration and production will constitute the 1949 program of the Horn Silver Mines Co., at its property in Beaver County, Utah.

Major improvements already accomplished include a new 60-ft headframe and a 40-ton ore hopper. The belt conveyor from the ore hopper to the bins has been changed, the shaft equipped with three-ton skips instead of the old cage and car type, a new hoisting cable installed to handle large skips, and changes made in hoisting equipment for heavier loads. The skips will automatically dump the ore into the hopper from where it will be carried by belt conveyor to the bins. The conveyor can also be diverted to the waste dump when necessary.

Underground, at the 850-ft level of the shaft, ore pockets have been cut to handle up to 250 tons each. The pockets will automatically load ore into the skips. Chutes have been cut to permit gravity flow of ore from stopes on the upper levels, through grizzly into a crusher for primary breaking of the ore.

Pumice Blocks for AEC Plant

Pumice blocks for the new Atomic Energy Commission's plant to be erected at the Salton Sea, in California, will be supplied by the Builders Supply Corp. of Phoenix, Ariz. The raw materials for the blocks will come from the corporation's own mines near Williams and Vicksburg, Ariz.

Builders Supply Corp., at its plant in Phoenix, processes ten carloads of pumice rock a day, turning out 75,000 cured pumice blocks. The plant consists of 13 kilns for curing brick with high-pressure steam, and at present is working on a 24-hour schedule, employing more than 100 persons. The corporation is owned by Paul Thomas, Roger Thomas, and Gilbert Olson.

Copper World Mills Complex Ore

About 500 tons of copper-lead-zinc-silver ore are being mined monthly by the Omega Metals Co. at its Copper World claims in the Cedar Valley district of Arizona. The company, headed by George F. Reed of Kingman, Ariz., is employing 26 men in the mine, working on a two-shift basis.

The main tunnel has been advanced about 800 ft and a crosscut driven 100 ft, with all workings timbered where necessary. The present ore body was located through diamond drilling and the management proposed to do additional drilling in an attempt to locate the extension of this deposit.

Ore from the Copper World is sent to the new selective flotation mill which Omega Metals erected at the old Boriana mine near Yucca. The

company plans to rework the Boriana dump as well as explore the mine for additional ore.

George Freeman of Kingman is mill superintendent, and H. V. Starchman of Yucca is mine superintendent.

Meteor Crater Investigation

Exclusive rights to conduct meteorite surveys and to recover meteoritic materials from the famous Meteor Crater near Winslow, Ariz., have been granted to the University of New Mexico. The announcement was made jointly by representatives of private interests holding the property and Dr. Lincoln LaPaz, director of the university's institute of meteoritics.

Dr. LaPaz stated that the contracts stipulated a specific prohibition against uncontrolled excavations or other activities that might deface the crater's scenic beauty or permanently damage its scientific value. Also prohibited is the commercializing of any of the meteoritical materials obtained by the university.

Garfield Anode Plant

Construction is proceeding on the $3,500,000 anode plant expected to be completed by 1950 as part of the Garfield expansion program of the American Smelting and Refining Co., W. J. O'Connor, general manager for the firm's Utah department, announced in early January. The plant will employ 200 or more men. Cement work on the anode project will go forward adjoining the smelter's converter plant. The new development will consist of a 147 by 450 ft plant plus a 300 by 25 ft leanto. Blister copper now produced at the smelter will be taken by the new plant, melted with carbon, accompanied by air injections, and cast into anode bars. The operation will take 12,000 tons a month of the 23,000 tons of blister produced. The balance goes to Baltimore, Md.

Colorado Mine Fire

All above ground property at the Lily coal mine, southeast of Lafayette, Colo., was destroyed by fire on January 1. Officials of the Lily-Marlino Co., operators of the mine, were not able to make an accurate estimate of the loss.

New Furnace in Oregon

Morris & Benson, at the Johnson Creek mine of the Amity Mining Co. near Princeville, Oreg., are erecting a 20-ton Nichols-Herreshoff furnace. Completion of the installation has been delayed. Underground development continues.

Lignite Production Record

Lignite mines in North Dakota set a new production record for the fiscal year ending June 30, it was revealed by the state mine inspectors' annual report in December. A total of 2,954,363 tons valued at $5,914,177.54 were produced which compares with 2,817,786 tons valued at $4,643,581.32 mined in fiscal 1947, the previous record year. A total of 107 mines, of which 75 were strip and 32 underground, were in operation during fiscal 1948 compared with 119 last year. The mines employed 782 men compared with 794 last year. Man-hours worked came to 1,498,124.

Montana Fluorspar Mill

Jay Bettles, operating a commercial fluorspar mine, near Superior, Mont., on a ten-year lease from the Coeur d'Alene Mines Extension Co., has announced arrangements for construction of a mill.

Silver Shield New Mill

The 250-ton flotation mill being erected by the Silver Shield Mining & Milling Co. at Ouray, Colo., is expected to be in operation not long after the first of the year. The company has obtained a lease on a number of patented claims near the millsite, which includes the Wunaka group. They are estimated to contain 150,000 tons of milling ore which could not be processed with previous facilities, but which can be handled with the new flotation unit.

Olamont Mills Gold-Silver Ore

Progress is being made at the Jewel mine of the Olamont Mining Co., west of Butte, Mont. A 100-ton mill has been erected and milling operations have been begun on gold-silver ore. The Jewel is located south of the famous Blue Bird mine which had a recorded production of over $1,000,000 in 105 days. C. W. Rose is superintendent and Clarence Lemler is mine foreman. W. D. Tidrick of Los Angeles is president of the company.

Gilsonite Piped With Oil

The American Gilsonite Co. has announced contemplated erection of a plant at Bonanza, Utah, which will render gilsonite soluble so it can be introduced into the Rangely-Salt Lake City pipeline of the Salt Lake Pipe Line Co., which serves the latter's North Salt Lake plant. The gilsonite will be refined in the same manner as the crude oil. The product will be used in the manufacture of heating fuel, heavy oils, and asphalt.

Alaskan Offices Will Test Uranium Ores

B. A. Stewart, Alaska Commissioner of Mines, has announced that the department's assay offices at Juneau, Fairbanks, Ketchikan, and Anchorage, will be fully equipped with instruments to test ore samples thought to be able to produce atomic energy. Arrangements with the raw materials section of the Atomic Energy Commission have been made for the testing equipment and devices.

Fire Destroys Hecla Tailings Mill

Hecla Mining Co.'s big tailings mill at Osburn, Idaho, was completely destroyed by fire on December 25, 1948. The plant was a combination sink-float and flotation unit of 3500-ton capacity. It was built in 1942 to treat an estimated 2,000,000 tons of river tailings accumulated from mills at Wallace, in Nine Mile and Canyon Creek, and at Mullan. This estimate was later increased to 3,000,000 tons and it is understood the plant had, up to the time of the fire, actually treated close to 4,000,000 tons of tailings product and had on hand about 5000 tons ready for treatment.

Patrick Coal Mine Reopened

Reorganized with H. S. Patrick, Yakima, Wash., as president, the Roslyn-Cascade Coal Co. will reopen the Patrick mine near Ronald, Wash. Closed in December, C. F. Larrabee of Bellingham, then president, blamed closure on high production costs. Patrick will take over active management and expressed confidence that "we can overcome the difficulties encountered in the past." The mine is the third largest producer in the state and normally employs 130 men.

Old Lode Mine Reopens

Work has begun in the old Caledonia mine property in El Dorado County, Calif., to develop an auriferous pyrite ore body about 5 ft wide. For nearly 50 years this property has been inactive. A compressor has been installed and shaft sinking is under way.

AEC Extends Price

The U. S. Atomic Energy Commission recently announced that guaranteed minimum prices paid for uranium-bearing carnotite-type and roscoelite-type ores of the Colorado Plateau area have been extended through June 30, 1954. The price extensions, guaranteed for more than five years, were made to encourage private investments in the development of new mines and the construction of additional mining facilities. The new extensions do not affect the guaranteed minimum prices for high-grade ores, which are not due to expire until 1958.

One of the principal modifications of Circular No. 5, which describes the price extension, is extension of the development allowance of 50¢ per pound of contained uranium oxide to all acceptable ores. Adjustments have also been made in the prices for ores within the range of 0.1 percent U_3O_8 and 0.2 percent U_3O_8 so that price increments will be more uniform.

The Commission has announced its intention to install a process in its Monticello, Utah, mill for processing high lime ores which are not acceptable under the regular price schedule, and which private operators have been unable to process.

Colorado Mining Association

A large group of mining men from the western states gathered in Denver, Colo., January 31 and February 1-2, to attend the 52nd meeting of the Colorado Mining Association.

Throughout the busy three-day program the session room in the Shirley-Savoy Hotel was packed with mining men eager to hear the papers presented by authorities in their specific fields.

Two luncheons, the Gold and Silver Banquet, and the traditional Sowbelly Dinner, were features of the program. At the luncheon on Monday an excellent survey of the developments and future use of atomic energy was presented by Fred R. Gruner of the Basic Industries Department, Allis-Chalmers Mfg. Co. Fred C. Bond of the same organization told of his personal experiences at Great Bear Lake, Canada. At the Tuesday luncheon, John D. Sullivan, assistant to the director, Battelle Memorial Institute, and chairman of the extractive metallurgy division of the AIME, presented a thoughtful address on metals and our standard of living.

At the Gold and Silver Banquet, Joseph Stagg Lawrence, vice-president, Empire Trust Co. and consultant to the Gold Producers Committee of the American Mining Congress, delivered a stirring address on the gold standard and the why and wherefore of a free market for gold. Sumner T. Pike, deputy chairman, Atomic Energy Commission, spoke on the policies of that agency. The Sowbelly Dinner was marked by the presentation of gold to Governor Lee Knous of Colorado for the purpose of reguilding the dome of the capitol of Colorado. Edward V. Hickey, director, office of production, National Security Resources Board, outlined the activities of this important organization in planning mobilization. The Hon. Pat McCarran, U. S. Senator from Nevada, spoke authoritatively on the current position of the United States in respect to the rest of the world and outlined in part the course of action which should be followed by this nation to maintain world leadership.

New officers were elected to serve the Colorado Mining Association for 1949 as follows: John Hamm, president; Merrill Shoup, first vice-president; H. S. Cobb, second vice-president; Franklin Bell, third vice-president; H. P. Ehrlinger, fourth vice-president; Ed Dickerman, fifth vice-president; Thelma Abel, secretary; H. W. C. Prommel, treasurer; and R. S. Palmer, executive director.

A number of exhibits were featured and several attracted a great deal of attention. Of special interest were those displaying atomic energy minerals and the equipment for detecting radioactivity.

Bodie Mine Ships High Grade

The Bodie mine in Yavapai County, Ariz., continues to make regular shipments of lead-zinc ore to the El Paso Smelter. Some of the ore is said to have been of sufficiently high-grade to net from $4000 to $5000 a ton. Plans are in progress for opening a new section of the mine. The Bodie is operated under lease by W. H. Kirkpatrick, St. Michael's Hotel, Prescott, Ariz.

Yankee Girl Developed in Depth

Sunshine Mining Co., Kellogg, Idaho, is now developing the Yankee Girl vein system on the 3700 level, the deepest opening in the silver belt, and has proven the continued downward extension of the orebody at 600 ft greater depth than heretofore attained. The vein has been opened on the 3100 level for 1000 ft in Sunshine-Metropolitan ground and for over 2000 ft in the adjoining Sunshine-Consolidated ground. Stopes started on the vein average from 30 to 50 oz in silver.

Idaho-Maryland Strikes New Vein

The Idaho-Maryland Mines Corp., Grass Valley, Calif., recently struck a new vein in a diamond drill hole which has been crosscutted. The vein is 20 ft wide. Ore from this vein is already being milled and is running about $10 per ton. Since the beginning of operations of the Idaho and the nearby Brunswick mine of the company, $75,000,000 of gold bullion has been recovered.

Drumlummon Mine Production

The famed Drumlummon Mine at Marysville, Mont. produced $250,000 worth of gold and silver in the first seven months of 1948 according to W. R. Wade, manager of the Montana Rainbow Mining Co. Production included 6127 oz of gold and 35,040 oz of silver. The Drumlummon produced $28,000,000 worth of gold prior to 1905. In the last two years the company has found five new vein systems.

Manufacturers Forum

New Mine Trolley Wire Guard

The Manhattan Rubber Division, Raybestos-Manhattan, Inc., at Passaic, N. J., has announced a flame-proof and high-voltage resistant mine trolley wire guard. Known as the Buronik trolley wire guard, it has a patented double-crimp feature that allows the guard to drape straight down naturally on both sides of the wire for maximum protection.

Made of synthetic Flexlastics, the guard is said to resist spread of fire, have a high dielectric strength, withstand acids and fumes, and be tear-proof, grease-proof, and mildew-proof. It is made in nominal widths of 12½ and 1/16 in. thick.

Rock Dusting at Working Faces

The new MSA Face Duster of the Mine Safety Appliances Co., Pittsburgh, Pa., is a lightweight, compact, high pressure machine for rock dusting jobs in rooms and break throughs. Complete dusting is reported to be accomplished in conveyor sections without removing the machine from the conveyor. The Face Duster can also be mounted on a cutting machine or drill truck for dust application during the mining cycle. A minimum volume of air is used to convey the rock dust through the 25 ft of hose so that the maximum amount of dust is applied to the ribs and roof.

New Drive Equipment for Anaconda Project

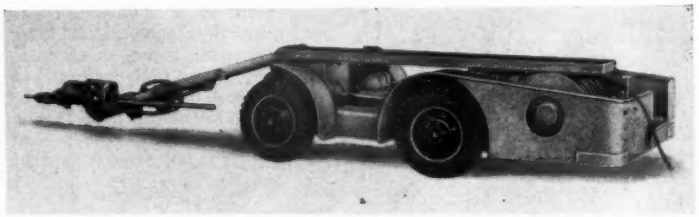
Complete electric hoist drive equipment, including one of the most powerful hoist motors in the country, will be used by the Anaconda Copper Mining Co. at Butte, Mont., to drive the ore hoist at the Kelley Shaft, part of Anaconda's $25,000,000 "Greater Butte Project."

The 600-v d-c motor, rated 3000-hp at 60 rpm is being built by General Electric Co. for shipment next fall. The drive equipment will be able to hoist 12 tons of ore per trip at a rate of 2300 fpm, and to complete a trip from a depth of 4335 ft in slightly more than two minutes, operating at full speed.

Rear Dump Truck Has Short Turning Radius

The new rear dump wagon—the E-16 Tournarocker—recently announced by R. G. LeTourneau, Inc., has a 90 deg turning radius. The Tournarocker is powered by the 150 hp Tournapull. The material is dumped over the rear end of the dump wagon behind its rear tires. Dumping is done by locking brakes on rear wheels at edge of dump and raising the bowl by means of an electric motor and cable attached to the bottom of the rear bowl. This pulls the prime mover back towards the rear wheels, tips the bowl, and dumps the material. The cable control also allows the unit to dump while traveling. The machine has a struck capacity of 16½ yd or 16 tons.

The company has also announced a new small sized unit, Model D Roadster Tournapull, for small yardage earth-moving projects. This unit is said to have high production capacity, speed, and mobility to make it especially adaptable for stripping light overburden, building and maintaining mine access roads, and handling other miscellaneous jobs around mines.



Permissible Tramdrill

A new one-man tramdrill with all controls in reach of the operator has recently been put on the market by Chicago Pneumatic Tool Co., New York.

With a wide range of speeds and feeds the all-electric drill is designed for drilling shot holes in coal up to 4½ in. diameter at speeds up to 8½ ft per minute. It can also be used for drilling rock or slate (except sandstone). Only 4 in. clearance is needed at roof or bottom.

The drill truck has 9 in. road clearance and handles with automotive type steering. A safety switch cuts the power from drill motor while tramming, and prevents truck from being moved when drill is operating.

Canadian Firm Buys Two of Largest Locomotives Built

Two 40-ton, mine-type electric locomotives, the largest units of that kind ever built by the General Electric Co., have been shipped to the Consolidated Mining and Smelting Co. of Canada, Ltd., Kimberley, B. C. The new units are of the four-axle, high speed, reversible trolley type, with an enclosed two-man cab at one end of the platform. The rated drawbar pull of the four 120-hp locomotive is 20,000 lb, with a maximum of 24,000. Voltage rating is 250; speed at rated voltage and drawbar pull is 9.5 mph; track gage is 36 in.; height above rail is 84 in., and over-all length is 29 ft 8 in. Air brakes are provided, with an auxiliary hand brake on the rear truck only. The box-type traction motors are individually cooled by 400 cfm motor-driven blower sets mounted on the platform. Electropneumatic type control is used.

— *Announcements* —

John J. Huether has been appointed manager of **General Electric's** Central Station Divisions and will also continue as manager of the Transportation Division. He succeeds **Ralph M. Darrin,** who has been elected a commercial vice-president assigned to customer relations work in the New England territory. Mr. Huether joined General Electric in 1922. He is a member of the National Board of Directors of the American Mining Congress and a member of the American Iron and Steel Institute, and the New York Railroad Club.

* * *

John Marshall Davis, metallurgical engineer, has joined the staff of **Western Machinery Co.** with headquarters in the Southeast. Mr. Davis will be engaged in metallurgical sales and service work for the WEMCO Equipment Division of the **Western-Knapp Engineering Co.,** a division of the firm.

* * *

T. B. Weichel, formerly with the U. S. Bureau of Mines, has joined the sales department of the **Hazard Insulated Wire Works Division** of **The Okonite Co.,** Wilkes-Barre, Pa., as a mining electrical engineer. Mr. Weichel has been active on committees of the American Mining Congress.

* * *

As of January 1, 1949, the corporate name of Salmon & Cowin, Inc., mining engineers and contractors at Birmingham, Ala., was changed to **Cowin & Company, Inc.,** mining engineers and contractors. No change in policy, personnel, or service will be made.

* * *

William H. Shank has been appointed advertising manager of **Hardinge Company, Inc.,** succeeding **R. C. Ferguson,** who is now Hardinge north central district manager.

* * *

Koppers Company, Inc., has announced the appointment of **F. W. Chambers** as manager of production for **Koppers Engineering and Construction Division** in Pittsburgh, Pa. **O. H. Chambers,** formerly assistant chief engineer, was appointed assistant manager of production for the division. **A. B. Fisher, Jr.,** a production engineer, was appointed chief engineer of the division. Mr. Fisher succeeds **Ragnar Berg,** who will become consulting engineer.

* * *

F. R. Benedict has been appointed manager of the headquarters engineering departments of the **Westinghouse Electric Corp.** He has served as manager of the industry engineering department since 1945.

* * *

William E. Shoupp has been named director of research and **Robert A. Bowman** was appointed manager of engineering for the **Westinghouse Electric Corp.'s** new Atomic Power Division. Both men will help guide the division's activities, including the construction and testing of an atomic power plant for the propulsion of naval vessels.

* * *

W. Van C. Brandt has been appointed manager of Railway and Motive Power Sales, a new division of the **Electric Storage Battery Co.,** Philadelphia. Mr. Brandt previously had been manager of Exide Motive Power Battery Sales.

* * *

M. B. (Jack) Crowley has been named district sales representative for **R. G. LeTourneau, Inc.,** assisting distributors in Virginia, West Virginia, and North and South Carolina. Mr. Crowley's headquarter city is Raleigh, N. C.

* * *

E. L. Klingler will direct the sale of Wickwire rope in the mid-continent area for the **Wickwire Spencer Steel Division** of the **Colorado Fuel & Iron Corp.** Mr. Klinger will be permanently located at Houston, Tex.

* * *

Wylie Brown, president of **Phelps Dodge Copper Products Corp.** since its founding, has been elected chairman of the board of directors of that corporation. **Whipple Jacobs,** former president of the **Belden Mfg. Co.** of Chicago, joined Phelps Dodge as president on January 1.

CATALOGS AND BULLETINS

DIESEL-POWERED TRUCKS. *The Euclid Road Machinery Co., Cleveland 17, Ohio.* In an attractive booklet entitled "Euclid Trucks in Mines and Quarries" various application of Euclid trucks and trailers are described and depicted in both full color and black and white photographs. The equipment manufactured by the company is shown in use stripping anthracite coal, mining iron ore, mercury, titanium ore, bituminous coal, manganese ore, Magnesium, and other metallic and nonmetallic materials.

MINING MACHINE AND DRILL BITS. *Kennametal Inc., Latrobe, Pa.* A catalog will be sent upon request depicting mining machine bits produced by the company along with prices and specifications. Kennametal rock bits and drill bits are similarly presented. The performance of Kennametal tools in various operating mines is noted. The catalog also contains information on drag and core bits for exploratory drilling, augers, and grinding tools.

POWER DISTRIBUTION. *Joy Manufacturing Co., Pittsburgh 22, Pa.* A new bulletin describes the latest models and application of the "Safety Circuit Center" portable electric power hook-up manufactured by the Mines Equipment Co., St. Louis 10, Mo. A cross-sectional layout illustrates the use of this equipment in modern mining utilizing rubber-tired equipment and conveyors.

RECTANGULAR MAGNETS. *Dings Magnetic Separator Co., Milwaukee 1½, Wis.* Uses of various types of rectangular magnets for installation above belt conveyors or non-magnetic chutes, for installation in the bottom of a chute, for submerged installation, in liquid conveying lines, and for use wherever automatic discharge of tramp iron is desired are described in a 12-page catalog. The particular advantages of rectangular magnets are listed. They are pictured in use in ore refining and in other applications.

ROCK DRILLS. *Joy Manufacturing Co., Pittsburgh, Pa.* A new 12-page bulletin recently released describes the Joy Silver Streak drifters with detailed drawings of the feed, dual valve, steel centralizer, locking chuck, and enclosed side rods. Cutaway drawings show the operating parts of the drill. A catalog section lists the various types of Silver Streak rock drills, drill jibs, the drillmobile, and Sulmet and throwaway bits. Copies of this bulletin 87-D may be obtained upon request.

SWITCHGEAR AND CONTROL DEVICES. *Allis-Chalmers Mfg. Co., Milwaukee, Wis.* A broad line of switchgear and control devices produced by the company are covered in a new 16-page guide. Rotary control switches, push button stations, generator voltage regulators, synchro-operators, thermal relays, dc remote positioning devices, indicating lamps, terminal boards and many other equipment items are described and illustrated. Standard wiring diagrams and photographs of typical station combinations accompany the data presented on push button stations. Copies of the bulletin No. 25B7095, "Allis-Chalmers Switchgear and Control Devices," are available upon request.

— Index To Advertisers —

EASIER TO SEE... SAFER TO USE

U.S. Royal Gold Cables

These mine trailing cables have a golden yellow color, for high visibility. They provide new highs in safety —without loss in efficiency.

The jacket is made of tough *pressure-cured* Neoprene —highly resistant to abrasion, cutting, heat, moisture, and oil. Beneath the jacket, a strong cotton braid covers the insulation.

The insulation itself is the finest rubber compound, with a tensile strength as high as 1400 pounds per sq. in. Conductors are of annealed coated copper, the stranding of which is designed specifically for mine trailing cables.

U.S. Royal Gold Cables are approved as tough enough for your roughest jobs only after they have passed seven gruelling "torture" tests. They are approved as flame-resistant by the Pennsylvania Department of Mines.

ALL U. S. ROYAL MINING MACHINE AND LOCOMOTIVE CABLES ARE AVAILABLE IN BLACK OR NEW GOLDEN YELLOW. Write today for free sample to United States Rubber Company, Wire and Cable Department, 1230 Avenue of the Americas, New York 20, N. Y.

APPROVED AS FLAME-RESISTANT
BY THE PENNSYLVANIA DEPARTMENT OF MINES

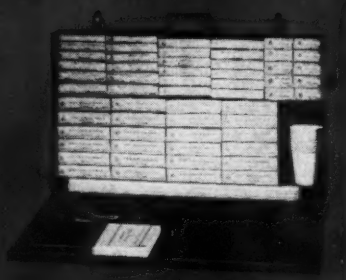
Here's fast and effective FIRST AID

—anywhere in the mine!

M S A

SAFETY EQUIPMENT HEADQUARTERS

FIRST AID EQUIPMENT

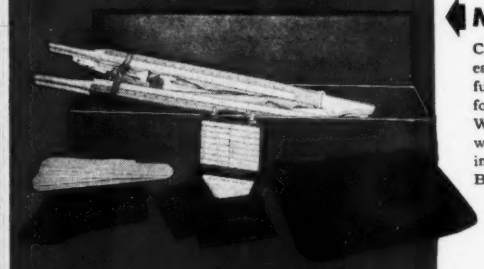


M.S.A. MINERS FIRST AID CABINET

Completely equipped. Contains assortment of first aid materials and supplies suited to requirements of the mine hospital or dressing station. Contents conform to materials recommended by the United States Bureau of Mines for first aid treatment. Designed for wall mounting, or transportation when required. Bulletin FA-74.

M.S.A. *All-Weather* FIRST AID KITS

Sturdy steel cases are dustproof and moistureproof, with a replaceable rubber gasket sealing edges when closed. Contain complete assortments of unit-packaged first aid materials; each unit package contains one or more complete treatments, without waste. The unit packages fit like blocks in the cases. Bulletin FA-101.

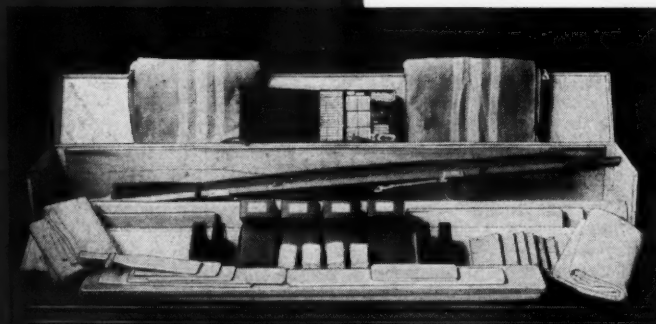


M.S.A. FOLDING STRETCHER OUTFIT

Complete emergency outfit in durable steel case—suitable for easy transportation underground. Folding stretcher opens to full-size army type. Included are a wool and a rubber blanket, four wood splints, two Heating Pads, and a 16-unit M.S.A. All-Weather First Aid Kit. Case is finished in red crackle enamel with white lettering. Dimensions are 56" x 12¾" x 8". Carrying handles at ends and brackets for mounting are standard. Bulletin FA-77.

M.S.A. REDI-HEAT BLOCK

Safe emergency heat source for first aid applications—always ready for immediate use; produces top heat in 60 seconds—employs no liquids. Replaceable Redi-Heat charge is unaffected by heat, moisture, weather or temperature—has unlimited storage life. Wrapped in cloth, the M.S.A. Redi-Heat Block provides heat for approximately one hour per charge. Bulletin FA-92.



. . . and for FIRST AID TRAINING

THE M.S.A. CONTEST OUTFIT

Strong steel box contains complete list of materials recommended by U. S. Bureau of Mines for first aid practice and contest work. Specially designed to facilitate transportation, prevent loss of materials, and aids neatness and efficiency. The box is made of 24 gauge steel, finished in white, equipped with strong handles on each end. Write for details!

MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS AND MEADE STREETS . . . PITTSBURGH 8, PA.

At Your Service—BRANCH OFFICES in the UNITED STATES

MINE SAFETY APPLIANCES CO. OF CANADA, LIMITED . . . Toronto, Montreal, Calgary, Winnipeg, Vancouver, New Glasgow, N.S.

MINE SAFETY APPLIANCES CO. (PTY.) LTD. . . . Johannesburg, South Africa; P. O. Box 116, Brakpan, Transvaal

CABLE ADDRESS "MINSAFE" PITTSBURGH